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# Improving Demographic Diversity in the U.S. Air Force Officer Corps

Nelson Lim, Louis T. Mariano, Amy G. Cox, David Schulker,  
Lawrence M. Hanser





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## Preface

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This report provides information regarding the relative scarcity of minorities and women among senior leaders (i.e., colonel and above) in the uniformed Air Force, with the goal of identifying contributing factors and potential policy responses. The underlying research investigated various aspects of the Air Force personnel system regarding this scarcity of minority and female leadership among line officers, and it also details appropriate analytical techniques for analyzing barriers to workforce diversity. The report contains recommendations informed by the workforce data to help the Air Force achieve its diversity goals. Finally, because it is beyond the scope of this report to articulate all underlying causes of Air Force diversity, this report also highlights areas where further research is needed to identify causes, mechanisms, and solutions.

This report is intended for Department of Defense policymakers interested in personnel diversity in the armed forces. It is the cumulative result of a number of studies spanning fiscal years 2007 through 2013 that were sponsored by the Office of the Assistant Secretary of the Air Force for Manpower and Reserve Affairs, Office of Strategic Diversity Integration (SAF/MRD), and the Air Force Deputy Chief of Staff for Manpower, Personnel and Services, and conducted within the Manpower, Personnel, and Training Program of RAND Project AIR FORCE.

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## Summary

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The U.S. Air Force values diversity as a “military necessity” (Air Force Instruction [AFI] 36-7001). Yet despite its efforts to create a force that mirrors the racial, ethnic, and gender differences of the nation’s population, minority groups and women are underrepresented in the active-duty line officer population, especially at senior levels. In general, the representation of women and racial/ethnic minority men and women decreases as rank increases. Over the past 20 years, the representation of racial/ethnic minorities and women among Air Force officers has increased substantially, but the pattern is still a cause of concern to Air Force leaders. This report investigates eligibility, accessions<sup>1</sup>, retention, and promotions among racial/ethnic minorities and women, with the goal of identifying the factors that led to the current state of workforce diversity and potential policy options for leaders who seek to improve diversity at the most senior levels of the military.

The Office of the Assistant Secretary of the Air Force for Manpower and Reserve Affairs, Office of Strategic Diversity Integration (SAF/MRD), and the Air Force Deputy Chief of Staff for Manpower, Personnel and Services asked RAND to assist the Air Force in understanding some of the underlying causes for low representation of minorities and women among its officer ranks. We analyzed data from multiple sources on Air Force eligibility, accessions, retention, and promotion, and on youths’ intention to serve in the armed forces. We developed a conceptual framework based on each of the four career outcomes (eligibility, accessions, promotions, and retention), developed benchmarks, and used quantitative data to assess whether and where barriers to equal opportunity exist. We also developed recommendations to help the Air Force achieve a greater level of racial/ethnic and gender diversity among line officers.

### Current Racial/Ethnic and Gender Diversity of Line Officers

Figure S.1 shows the percentage of each pay grade that is non-white<sup>2</sup> (0 percent to 24 percent on the y-axis). The “All Minority” group includes African Americans, Hispanics, Asian Americans, Pacific Islanders, and Native Americans. Together, minorities represent 23 percent of second lieutenants as of 2012, and that figure declines steadily between ranks until the rank of O-9. Eleven percent of all colonels are non-white, but only 4 percent of general officers. African Americans account for 4 to 7 percent of each pay grade between second lieutenant (O-1) and lieutenant general (O-9). There are changes in the representation of each group between O-7 (brigadier general) and O-10 (general), but there are only a few officers at these ranks, of

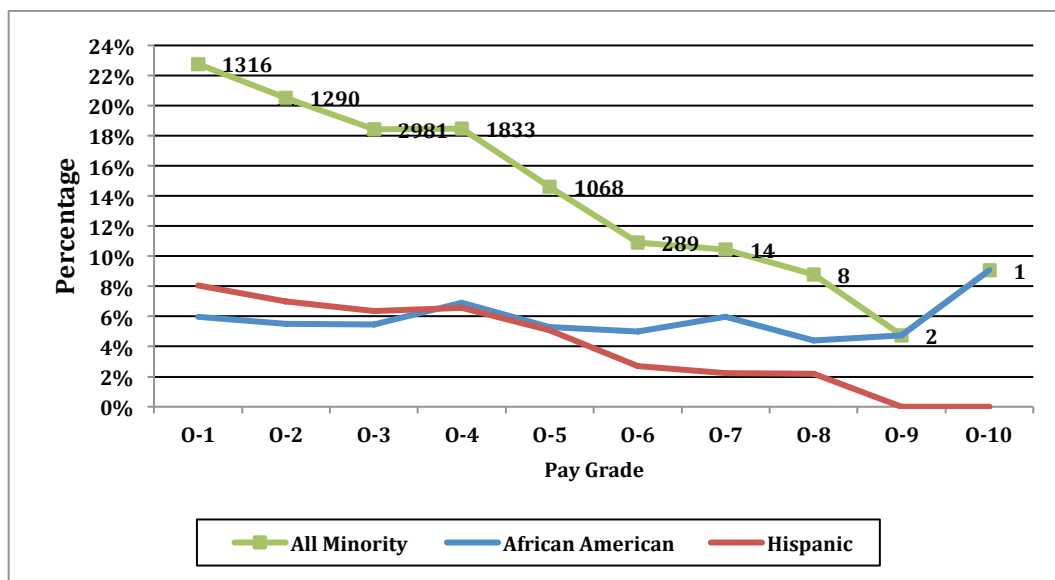
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<sup>1</sup> Accessions are new entrants to the armed forces, e.g., new Air Force officers in this case.

<sup>2</sup> Throughout this document, the term “white” means “non-Hispanic white.”

approximately 285 total general officers at the time of these data.<sup>3</sup> Following African Americans, Hispanics are the most represented minority. Second lieutenants (O-1) through lieutenant colonels (O-5) are between 5 and 8 percent Hispanic, after which Hispanics make up between 2 and 3 percent of ranks O-6 through O-8. There is no representation of Hispanics among O-9 and O-10. The analyses that follow address how much of this pattern is the result of changes in the U.S. population over the past decades and how much is the result of racial/ethnic differences in eligibility, accession, retention, and promotion.

**Figure S.1. Percentage of Racial/Ethnic Groups, by Grade, in 2012**

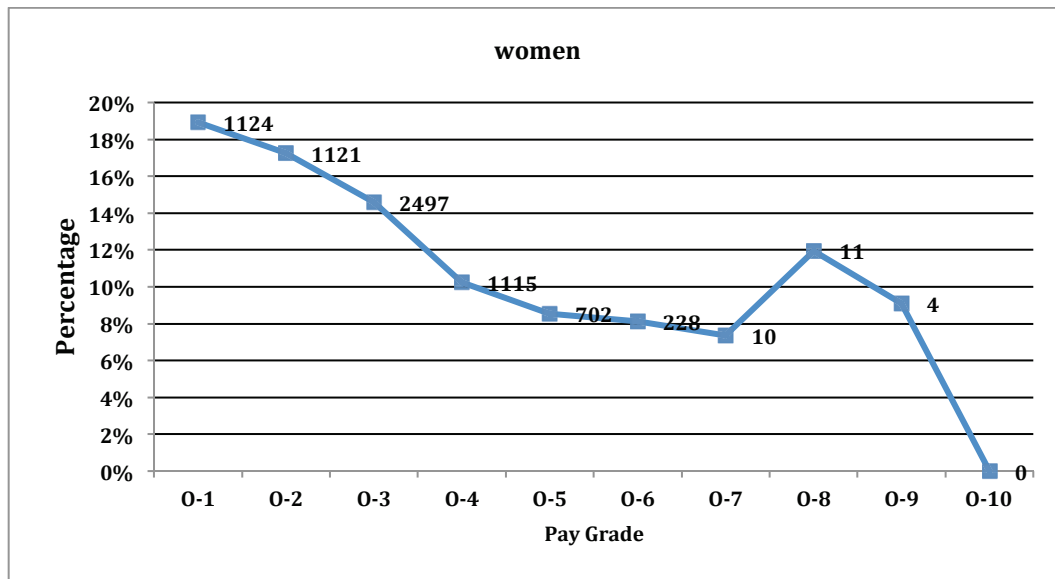


SOURCE: Authors' tabulation of Air Force data.

Figure S.2 shows the representation of female officers, by grade. Similar to racial/ethnic minorities, women make up 19 percent of the Air Force's second lieutenants. However, that number declines in the highest grades, going down to 8 percent of colonels and about 9 percent of general officers, or 25 out of 283. Subsequent analyses look at the relevance of eligibility, accession, retention, and promotion to this pattern by gender.

<sup>3</sup> The number of general officers varies frequently with retirements and promotions but is usually around 300.

**Figure S.2. Female Force Composition, by Grade, in 2012**



SOURCE: Authors' tabulation of Air Force data.

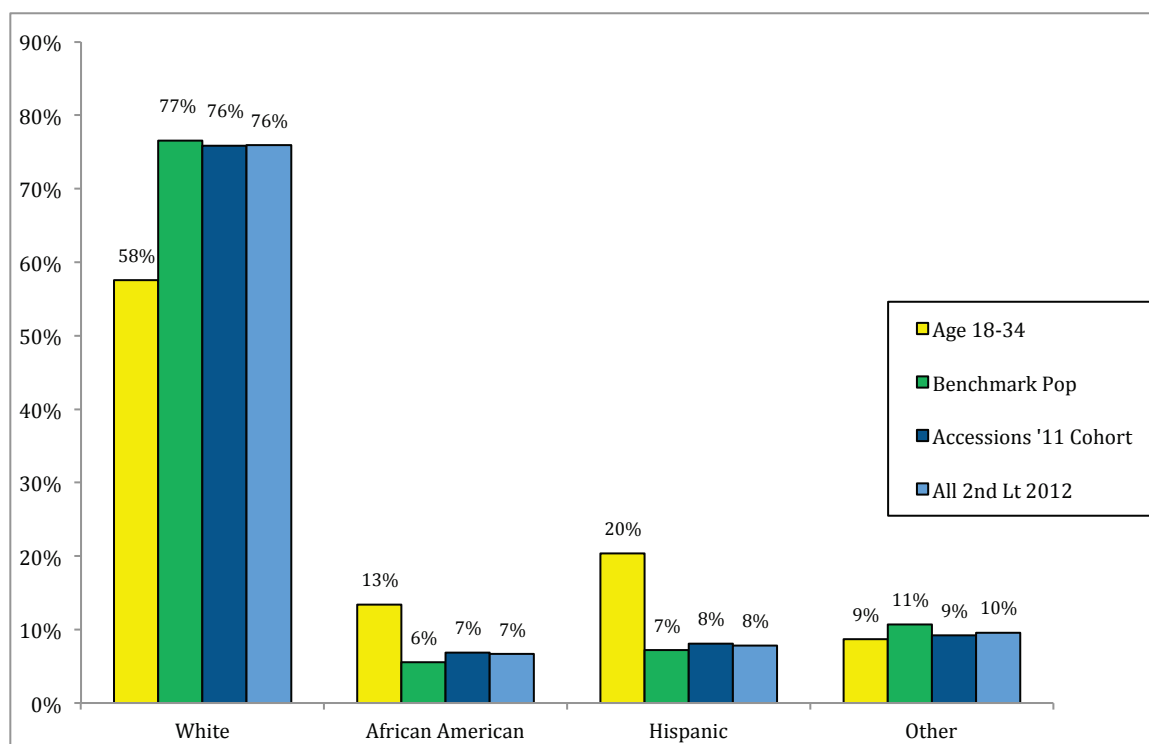
## Eligibility Rates Are Affected by Factors Outside of Air Force's Control

With few exceptions, new officers must begin as second lieutenants (O-1). To commission as officers, individuals must meet age, citizenship, and health requirements and go through a commissioning program that typically requires the completion of a college degree. While the requirements apply equally to all demographic groups, the rates at which individuals meet these requirements vary across demographic groups. For example, 74 percent of the white population age 18–34 does not meet the education requirement. After they are eliminated, an additional 1 percent of the white population is disqualified due to the citizenship requirement. An additional 11 percent do not meet the health requirements (body composition and medical eligibility). Thus, the remaining 14 percent of the white population is eligible to commission.

African Americans and Hispanics are much less likely than whites and other race/ethnicities to meet all the requirements. In large part, this is due to the fact that members of these groups are less likely to have a college degree. Those in the “other” racial/ethnic group, which includes Asian Americans, Pacific Islanders, and Native Americans, are the least likely to be disqualified by the education requirement (65 percent), but this group also features the lowest proportion of U.S. citizens among college graduates, lowering its overall eligibility rate to 13 percent (slightly below the rate for whites). Because college attainment rates among noncitizen Hispanics are so low, the citizenship requirement in itself is not a major disqualifier of Hispanics. Overall, whites and other race/ethnicities meet eligibility requirements at around three to four times the rate of African Americans and Hispanics.

Figure S.3 shows the racial/ethnic distribution of the total population age 18–34, the eligible population, the calendar year 2011 officer accession cohort, and Air Force second lieutenants in April 2012. Both the accession cohort and the second lieutenant cohort include only line officers.

**Figure S.3. Air Force Line Officers and Eligible Populations, by Race/Ethnicity**



SOURCE: Authors' tabulation of Air Force and civilian survey data.

Though the 2011 accession cohort has very small proportions of African Americans and Hispanics, these numbers are consistent with their proportions in the officer-eligible group. These results indicate that the Air Force is matching the levels of racial/ethnic diversity expected by the eligible population. Ultimately, this presents a challenge to the Air Force, because it cannot control the education, health, and citizenship status of the U.S. population. It should be noted, however, that African Americans and Hispanics show higher intention to serve in the military than whites on youth surveys. If this admittedly rough measure of intention to serve is taken into account, we would actually expect a higher proportion of African Americans and Hispanics among incoming officers. Thus, while most of the racial/ethnic differences between the Air Force accessions and the general population are explained by the fact that some minority groups tend to meet Air Force requirements at lower rates, it may be that outreach to minorities may be ineffective, or that more appealing options outside the Air Force may exist by the time youth graduate from college.

Women, on the other hand, have a higher rate of eligibility (13 percent) than do men (9 percent). Overall, women are more likely to have college degrees. Therefore, based on eligibility



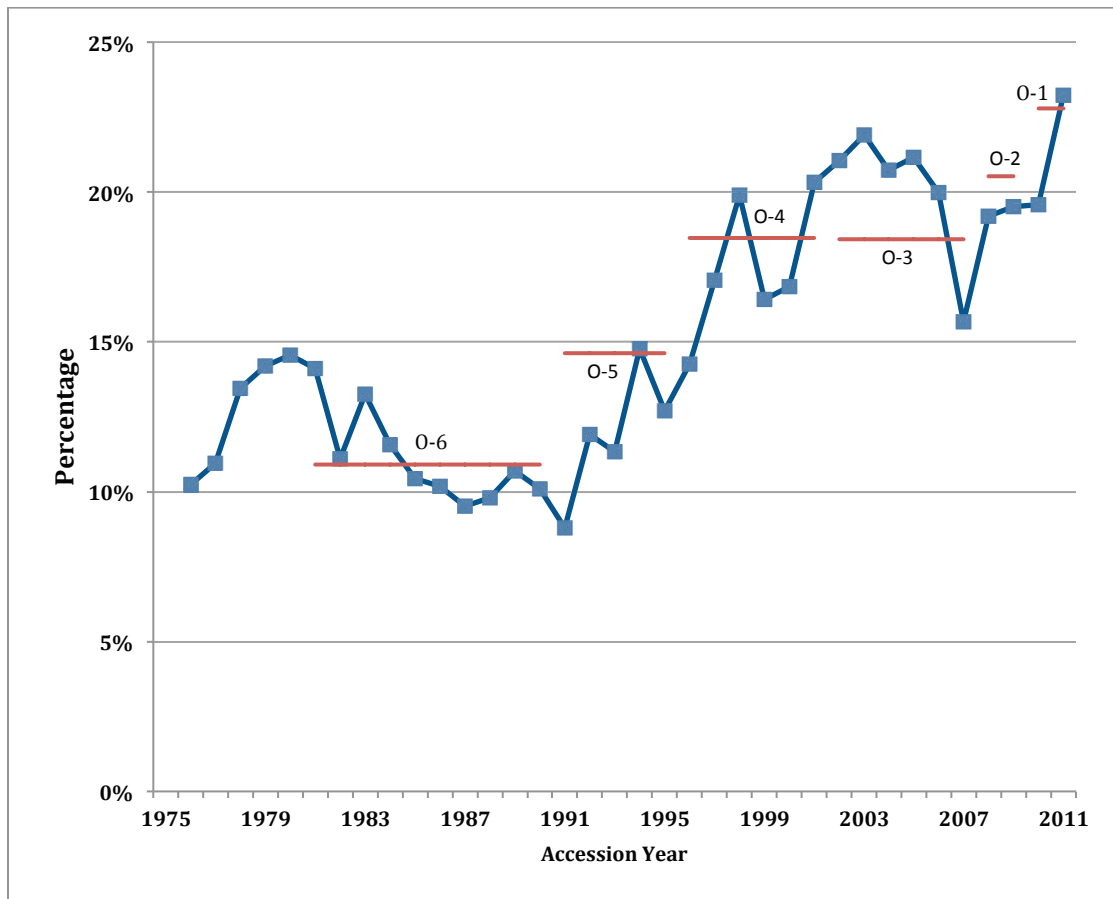
alone, the Air Force should have a *higher* proportion of women than their proportion among 18-34 year-olds indicates. This changes if intention to serve in the military is taken into account. Youth surveys show that men prefer military service at much higher rates than women: For every woman interested in joining the military, there are almost three men interested. This suggests that to increase the proportion of women entering the Air Force, the Air Force needs to convince more young women that it is a viable employer providing viable career options.

## Lower Retention of Women Unexplained

Officer accessions are the entry of new officers into the Air Force, and officer development is the training and growth of officers as they progress through the ranks. Officer promotions are based on decisions about whether to advance officers into higher ranks, and officer retention is based on officers' decisions to remain in the Air Force. The diversity of accessions, promotions, and retention among officers is affected by the cohort of officers entering into the ranks at any given point. If new officers are not diverse, it would be difficult, and likely impossible, for the Air Force to achieve diversity in its higher grades even with unrestricted access to development programs, a promotion system blind to ethnicity and gender, and retention rates equalized across different groups.

Figure S.4 shows the success of the Air Force in retaining its racial/ethnic minority officers and demonstrates the close association between racial/ethnic diversity of accessions and racial/ethnic diversity of higher pay grades. The red horizontal lines show current minority representation at each rank, while the blue lines show minority representation among the accession groups that now make up those particular ranks. This close association reflects the fact that there is little difference in retention between minority and white officers.

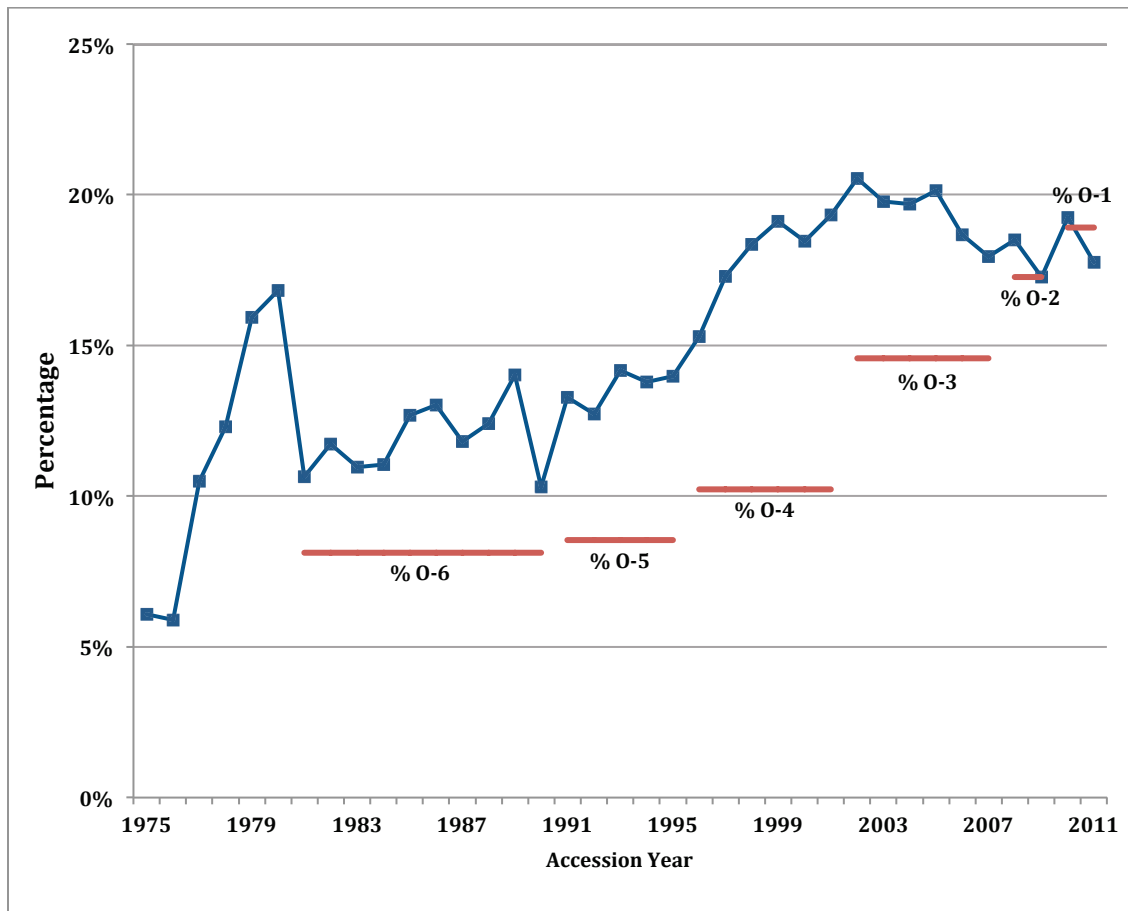
**Figure S.4. Minority Representation in Recent Air Force Line Officer Accession Cohorts and Current Grades, 1975–2011**



SOURCE: Authors' tabulation of Air Force data.

Gender diversity among accessions has also increased significantly, from 6 percent in 1975 to 18 percent in 2011. This represents a relative increase in women of 200 percent during this period. Unlike minorities, however, the fraction of women in each pay grade is generally lower than the fraction in corresponding accession year groups. The gaps grow significantly larger in higher pay grades. As illustrated in Figure S.5, 17–18 percent of the 2008 and 2009 accession year groups were women. They represent 18.5 percent of all first lieutenants (labeled “% O-2”). The year groups that currently hold the grade of major were 15–19 percent women when they began their Air Force careers, but only 10 percent of all current majors are women (labeled “% O-4”). At the highest end of the line officer spectrum, 8 percent of colonels are women, but these 1981–1990 year groups comprised between 10 and 14 percent women when they began (labeled “% O-6”).

**Figure S.5. Representation of Women in Recent Air Force Line Officer Accession Cohorts and Current Grades, 1975–2011**



SOURCE: Authors' tabulation of Air Force data.

As these results suggest, the retention of women is significantly lower than that of men. One hypothesis is that this is due to decisions about having children, raising young children, or caring for elders. When comparing women to men with similar characteristics, such as marital status and number of dependent children, it appears that some differences in retention in early career are associated with these characteristics, but much is unexplained. This finding, along with comparisons of men and women's retention rates in the civilian workforce, raises the question of what about women's experience in the labor market in general, including the Air Force, may lead to their having different retention rates than men.

## The Promotion System Overall Is Fair to All, but Some Questions Remain

The promotion process involves the timeline for promotion, the commander's recommendation, and the promotion decision. The timeline for promotion for most cases is the typical year that a person would be up for promotion, known as "in the promotion zone." Sometimes, officers with very strong records are suggested for promotion one or even two years early, known as "below

the promotion zone.” The commander’s recommendation is the final recommendation for promotion given to each officer facing a promotion board. For most cases, this is a recommendation of “promote.” A limited number of officers receive a recommendation of “definitely promote”; this is an official designation that is supposed to be reserved for top-performing officers. Finally, there is the promotion decision itself, which is made by a single promotion board for each grade.

We conducted 120 comparisons of minorities/women with whites/men who had similar backgrounds, technical abilities, assignment histories, performance records, awards, and career field characteristics. Eight of these comparisons yielded statistically significant differences in promotion rates by race/ethnicity or gender. On the positive side, this means that there was no evidence of differential outcomes in 93 percent of the groups compared by race/ethnicity or gender. This suggests that the Air Force’s promotion system treats people the same nearly all of the time. Several relevant variables were not amenable to statistical analyses, such as comments within the commander’s recommendation that might stratify a candidate among their peers. The eight remaining differences might be attributable to these remaining unobserved factors or real group differences.

In 30 gender comparisons, in which we compared women with men who had the same characteristics, we found a significant unexplained gap two times. Both of these occurrences involved U.S. Air Force Academy (USAFA) graduates. The selection rate for women for on-time promotion (“in the promotion zone”) to the rank of major among non-“definitely promote” candidates was higher than expected, while the selection rate for women for early promotion (“below the promotion zone”) to the rank of colonel was lower than expected.

Of the 60 total comparisons between African Americans and whites with similar characteristics, four continued to have an unexplained gap, and in all of these the gap favored whites. African American officers were significantly less likely than similar white officers to be awarded “definitely promote” in three of the comparisons. In one additional significant gap, African American officers were less likely than similar whites to be selected for colonel, among those who did not graduate from the USAFA or historically black colleges and universities. In addition, whites with similar characteristics were favored over Hispanics in two of 30 comparisons. One significant gap was for early selection to colonel among non-USAFA graduates, and the other was for award of a “definitely promote” designation among USAFA graduates on-time for colonel. We then examined some of the characteristics that are closely related to promotion outcomes. Minority groups in the Air Force, on average, are less likely to have early markers of career success, such as high USAFA order of merit scores, than whites. The reasons for this are not clear, but the effect builds over time. The implication of these findings is that as officers’ careers progress, minority groups with fewer of these early markers have greatly diminished promotion prospects.

## Recommendations

This study examined the dynamics of Air Force officer progression through the lens of race/ethnicity and gender. The Air Force may continue to be challenged in enhancing the diversity of senior leadership, because ultimately the organization cannot control all factors contributing to specific demographic groups' different rates of eligibility. However, there are a number of steps that the Air Force can take to improve outcomes in areas in which it has direct influence.

### *Recruiting*

#### Use Benchmarks to Assess the Diversity of Incoming Officers and Plan Recruiting Actions

Chapter Two of this report discusses the development and use of benchmarks to obtain a more accurate reflection of the population from which officers are drawn and a more accurate goal for the Air Force to work to achieve. Benchmarks will also allow leaders to develop systematic efforts that focus its strategies for specific racial/ethnic groups and women. For example, including goals for the number of applicants from underrepresented groups would clarify the amount that recruiters need to change their targets and enable ongoing assessment of progress. Other examples of recruiting actions that could be brought to bear include more recruiters, more or different advertising, or more generous incentives. All efforts should have data-driven evaluation plans built into them to assess effectiveness and cost.

### *Retention*

#### Identify and Address Factors Contributing to Lower Retention Rates Among Women

Marital status, race/ethnicity, number of dependent children, rank, occupation, and source of commission do not appear to completely explain lower retention among more experienced women in the officer corps. This may be the result of these characteristics having a different effect on retention for men than for women, or it may be the result of other characteristics not available in the data used for analyses by the research team. Either way, further work is needed to identify what specific factors contribute to women's lower retention, relative to men's.

### *Promotion*

#### Actively Recruit and Develop Tomorrow's Future Officers

The findings in this study revealed that several characteristics are strong predictors of promotion to senior levels. These characteristics are developed early in an officer's career. The importance of these characteristics grows over time, because promotion prospects at each level take into account an officer's entire career; they are not reset at each pay grade. For minority groups, who are less likely to have at least some of these vital characteristics, promotion prospects diminish as their career moves forward. The policy implications of the analysis of promotion, then, circle

back to recruiting and accessions, where many of these characteristics begin. Recruiters, college selection officials for Reserve Officer Training Corps (ROTC) and the USAFA, and those responsible for final selection for commissioning need to identify applicants of all racial/ethnic groups who are of high and *comparable* quality. This means that high school students selected for ROTC and the USAFA need to be comparably strong, that ROTC programs should draw from selective colleges and universities, and that minority cadets at the USAFA have the same level of qualifications, on average, as white cadets. As shown in the results, even a small change in the rankings of minority USAFA undergraduates can lead to notable changes in diversity later.

#### Seek to Foster Diversity in Key Fields

There is a lack of racial/ethnic minorities and women in rated career fields—including pilot, navigator, air battle manager, combat systems officer, and flight surgeon—which have the highest promotion and retention rates. Currently, minorities and women are less likely than whites and men to be in rated fields and more likely to be in fields that have lower promotion and retention rates. The reasons that whites and men are more likely to be in rated fields than either minorities or women need to be better understood and barriers removed or overcome where possible.

## Acknowledgments

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This report is a cumulative and collaborative effort by the RAND research team and Air Force Secretariat and Headquarters staffs over several years.

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## Abbreviations

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ACS	American Community Survey
AF/A1	Air Force Deputy Chief of Staff, Manpower, Personnel and Services
AFPD	Air Force Policy Directive
AFBAWG	Air Force Barrier Analysis Working Group
AFIT	Air Force Institute of Technology
APZ	above the promotion zone
BPZ	below the promotion zone
BRFSS	Behavioral Risk Factor Surveillance System
CCR	cumulative continuation rate
CFM	career field manager
DG	distinguished graduate
DP	definitely promote
GBM	generalized boosted model
HQ	Headquarters
HSBCU	historically black college or university
IDE	intermediate developmental education
IPZ	in the promotion zone
MLDC	Military Leadership Diversity Commission
NLSY	National Longitudinal Survey of Youth
USAFA	United States Air Force Academy
OTS	Officer Training School
ROTC	Reserve Officer Training Corps
SDE	senior developmental education
SOS	Squadron Officer School
YOS	year of service



# 1. Introduction

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## Motivation for This Study

A cross-sectional snapshot of the 2012 U.S. Air Force active-duty officer population (Figures 1.1 and 1.2) shows the following general pattern: As rank increases, the fraction of officers who are members of a racial/ethnic minority or who are women decreases. The representation of minorities and women in the officer ranks has increased significantly over the past couple of decades, but this pattern has caused concern within the Air Force, because senior leaders believe “diversity is a military necessity” (Air Force Instruction [AFI] 36-7001)). This report investigates officer eligibility, accessions, retention, and promotions by race/ethnicity and gender to identify factors that led to the current state of diversity among Air Force officers, and to identify potential policy avenues for leaders who seek to improve diversity at the most senior levels of the military.

Even though the Air Force defines diversity broadly to go beyond racial/ethnic and gender diversity, representation of minorities and women in higher ranks remains one of the critical indicators of success for Air Force diversity initiatives to attract, recruit, develop, and retain a diverse workforce (United States Air Force Diversity Strategic Roadmap, 2010). Air Force Policy Directive 36-70 states that the Deputy Chief of Staff, Manpower, Personnel and Services (AF/A1) “will be responsible for providing assessment and analysis of diversity initiatives.” AFI 36-7001 states that Air Force Directorate of Force Development (AF/A1D) will “coordinate with the Air Force Career Field Managers (CFMs) to perform barrier analysis” and the “Air Force Barrier Analysis Working Group (AFBAWG), led by AF/A1Q, is charged to identify and, if appropriate, propose elimination of barriers.” This report can be considered an approach to barrier analysis that identifies factors influencing the declining representation of minorities and women among senior officer ranks.

In addition to these internal motivations, Congress created the Military Leadership Diversity Commission (MLDC) in 2009 to “conduct a comprehensive evaluation and assessment of policies and practices that shape diversity among military leaders” (MLDC, 2011b, p. iii). The MLDC pointed out in its final report that, as an organization that promotes from within, the Department of Defense’s (DoD’s) top leadership is dependent upon the pipeline of junior officers, meaning that future senior leaders must come from the pool of current junior officers. Looking at the pipeline, the MLDC found no prospect of further increase in the representation of minorities or women in the higher ranks unless DoD implements systematic changes in how the services outreach, recruit, develop, retain, and promote their members.

In other words, societal trends alone will not close the gap in minorities and women among senior leaders without policy intervention. The increases seen in the representation of minorities

and women in the past several years will not simply continue on its own. To avoid the negative consequences that accompany a lack of equal opportunity (real or perceived), the MLDC recommended identifying barriers to minorities' and women's attainment of top leadership positions.

## Snapshot of Racial/Ethnic and Gender Diversity

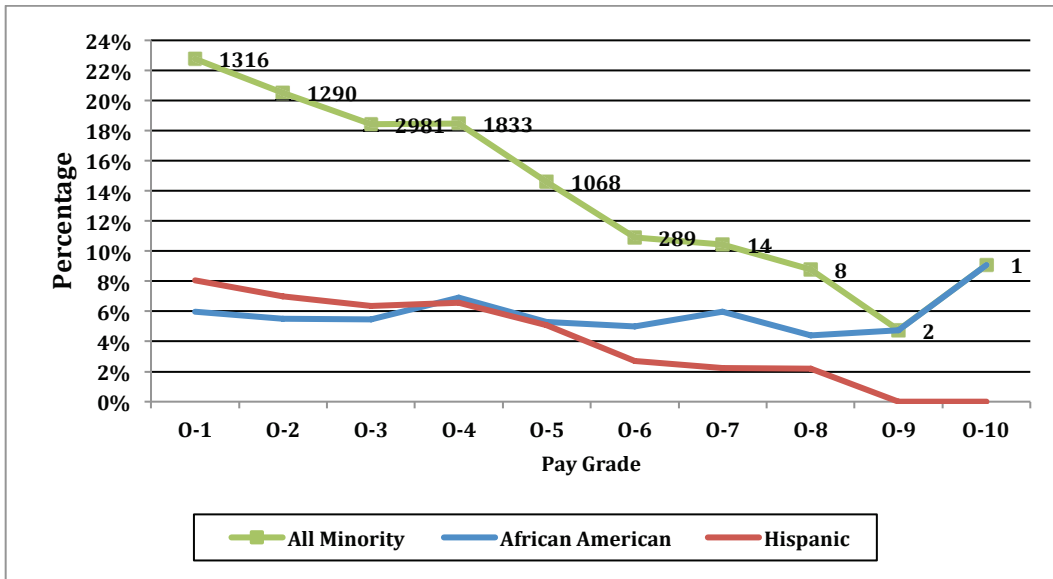
As stated above, though the percentages of women and minorities at each rank have increased in the past 20 years (see Chapter Three), a current snapshot of the makeup of the Air Force officer corps continues to show a lower percentage of minorities and women in successively higher ranks. Figure 1.1 shows the percentage of each pay grade that is non-white (0 percent to 24 percent on the y-axis).<sup>4</sup> We also show the number in each pay grade on the graph for informational purposes; note that these absolute numbers are not an accurate reflection of changes across the grades, because the years spent in each pay grade varies. The "All Minority" group includes African Americans, Hispanics, Asian Americans, Pacific Islanders, and Native Americans. Together, minorities represent 23 percent of the second lieutenants as of 2012, and that figure declines steadily between ranks until the rank of O-9. Eleven percent of all colonels are non-white, but only 4 percent of general officers. African Americans account for 4 to 7 percent of each pay grade between second lieutenant (O-1) and major general (O-4). There are changes in the percentages of each group between O-7 (brigadier general) and O-10 (general), but there are only a few officers at these ranks, totaling approximately 285 total general officers at the time of these data.<sup>5</sup> Following African Americans, Hispanics are the most represented minority. Second lieutenants (O-1) through lieutenant colonels (O-5) are between 5 and 8 percent Hispanic, after which Hispanics make up between 2 and 3 percent of ranks O-6 through O-8. There is no representation of Hispanics among O-9 and O-10.

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<sup>4</sup> Throughout this document, the term "white" means "non-Hispanic white."

<sup>5</sup> The number of general officers varies frequently with retirements and promotions but is usually around 300.

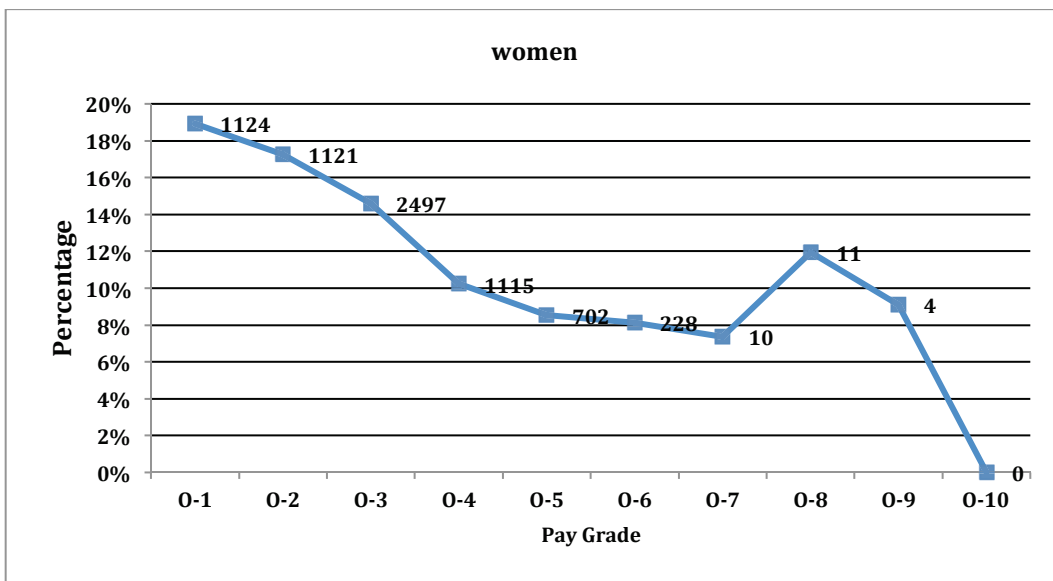
**Figure 1.1. Percentage of Racial/Ethnic Groups, by Grade, in 2012**



SOURCE: Authors' tabulation of Air Force data.

Figure 1.2 shows the representation of female officers, by grade. Similar to racial/ethnic minorities, women make up 19 percent of the Air Force's second lieutenants. However, that number declines in the highest grades, going down to 8 percent of colonels and about 9 percent of general officers, or 25 out of 283.

**Figure 1.2. Female Force Composition, by Grade, 2012**



SOURCE: Authors' tabulation of Air Force data.

As snapshots, Figures 1.1 and 1.2 provide an indicator of lower diversity at the senior levels than at the entry levels of the Air Force officer corps. However, they do not provide any understanding of the mechanisms underlying this trend. For example, retention or promotion rates might vary by race/ethnicity and gender, or earlier cohorts might have had lower eligibility or accession rates for racial/ethnic minorities and women. The analyses that follow disaggregate this snapshot into its various components.

## Potential Factors Shaping Senior Leader Diversity

The concept of racial/ethnic representation in the military has traditionally referred to the degree that the military matches the general population in its racial/ethnic makeup. The total U.S. population is 13 percent African-American, 16 percent Hispanic, and 5 percent Asian American.<sup>6</sup> Air Force representation in all officer grades is below these proportions and below the half of the population that women comprise. At higher grades, lower racial/ethnic diversity in the Air Force partly reflects the lower racial/ethnic diversity in the U.S. population when these officers first joined, though there are also other factors on the path to becoming a general officer that affect diversity.

The first factor is that there may be a difference between the general population and the population eligible and willing to become military officers. The Air Force imposes citizenship, age, education, and health requirements that all officers must meet. Continual reevaluation of eligibility criteria can maximize the ability to predict officer performance later as well as to minimize minority and gender exclusion. At the same time, to the degree that different groups meet eligibility requirements at different rates, the population eligible to become officers would not be representative of the population at large.

Beyond eligibility, diversity in the Air Force begins with the accession of new officers. With few exceptions (e.g., some non-line officers, who are not discussed in this report), all new recruits begin as second lieutenants. If retention rates and promotion probabilities are equivalent across racial/ethnic and gender groups, we would expect the most senior levels to be no more diverse than the original accession cohorts from which they are drawn.

Individuals who are accessed into the Air Force face promotion boards and retention decisions throughout the course of their careers. If some groups are selected for promotion at lower rates, their representation will decrease from one grade to the next. In the same way, if some groups had lower rates of retention, this would contribute to the phenomena shown in Figures 1.1 and 1.2.

Finally, if members of different career fields have different promotion and retention rates, and racial/ethnic and gender groups do not distribute themselves equally across career fields,

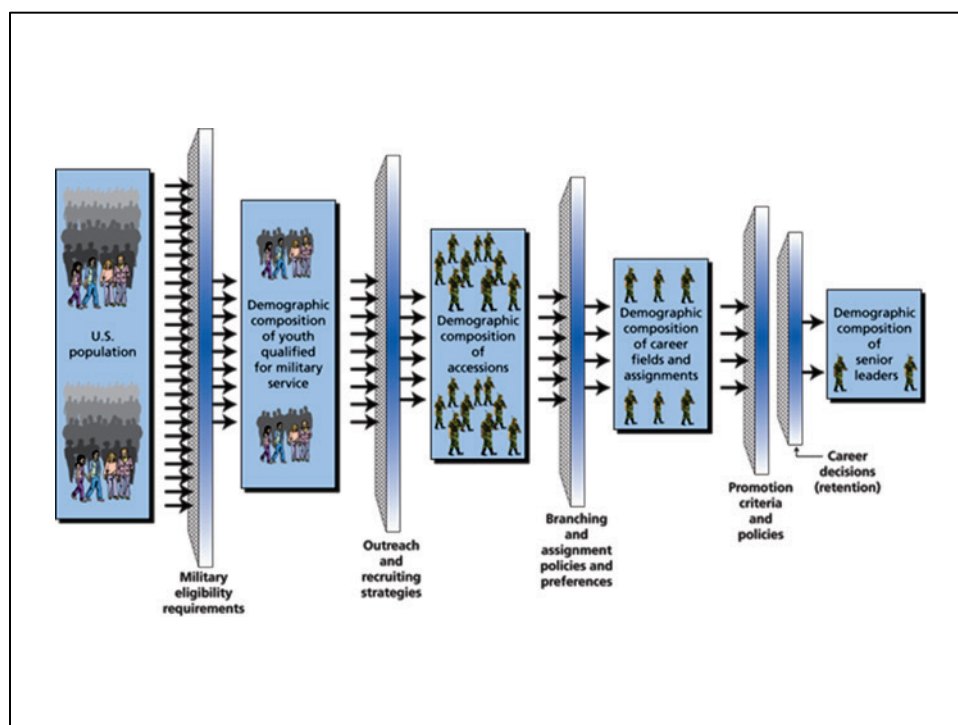
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<sup>6</sup> See Karen R. Humes, Nicholas A. Jones, and Roberto R. Ramirez, *Overview of Race and Hispanic Origin: 2010*, Washington, D.C.: U.S. Department of Commerce, Economics and Statistics Administration, U. S. Census Bureau, March 2011.

then the diversity seen in higher ranks will also differ from the diversity seen at the accession point. For example, most officers have a minimum four-year active duty service commitment, but pilots incur a 10-year commitment, and combat systems officers and air battle managers incur a six-year commitment. Retention rates are significantly higher for those in career fields with longer service commitments. Promotion rates may also vary across career fields.

The whole picture of senior leadership diversity in the Air Force will depend on all of these areas of the military personnel life cycle, depicted in Figure 1.3. Eligibility requirements determine the population eligible to serve. Recruiting determines whether accession cohorts mirror the eligible population. Promotions and retention determine whether they all progress through higher grades at equal rates. Choice of a career field can strongly influence retention and promotion. Together, these factors ultimately determine the racial/ethnic and gender makeup of the highest levels of U.S. Air Force leadership.

**Figure 1.3. Military Personnel Life Cycle Shaping Demographic Diversity of Senior Leaders**



SOURCE: MLDC, 2011b, p. 45.

This is not to say that the senior-level diversity of the Air Force can be reduced to a simple set of processes. The diversity of senior leadership is the result of years of officer development, unit experiences, commander priorities and influence, force-shaping and other policies, and the national environment in which the Air Force operates. For example, force-shaping policies that change the size of the force at different points in time can affect some career fields more than others and thereby affect diversity indirectly, and cultural norms may direct men toward greater

interest in the military than women. In addition, these factors can change over time and contribute to trends in diversity. Our focus on eligibility, accessions, retention, and promotion is not to suggest that other factors do not matter; rather, it arises from the fact that these are four of the key mechanisms through which any of the factors affecting diversity operate. To the degree that we can understand these dynamics, we can move closer to an understanding of diversity in the Air Force. We include other contributing factors where possible in these analyses (e.g., family and career factors).

## Conceptual Framework

To evaluate the level of racial/ethnic and gender diversity in the Air Force, we examine the four outcomes discussed above: eligibility, accessions, promotions, and retention.

After identifying in Chapter Two the racial/ethnic and gender composition of the *eligible* general population, we examine, in Chapter Three, recent accession cohorts to determine whether minority groups have been underrepresented at the accession or commissioning point. We then estimate the factors affecting retention among women and compare these results to what is observed in the civilian sector. In Chapter Four, we consider the rate at which officers who are white or men would be promoted if they instead had the same individual characteristics as officers who are minority or women to determine what portion of the promotion gap is explained by observable characteristics. Finally, Chapter Five concludes and offers recommendations for achieving a greater level of racial/ethnic and gender diversity among Air Force line officers.

Within the Air Force, there are no official diversity proportion goals or quotas with which these numbers can be compared. However, the Air Force has policies in place to provide equal opportunities to candidates regardless of gender or race/ethnicity, from the pre-accession stages through promotion to senior leadership, as well as to identify and recruit people in all groups with the formal and informal qualifications to be successful Air Force officers. This quantitative analysis can provide insight into the degree that these more general goals are being met.

## 2. Constructing Population Benchmarks for Air Force Line Officers

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The Air Force differs from civilian organizations in that its executive leadership—the officer corps—almost exclusively enters the organization at a single point. With few exceptions, such as those who enter the Air Force as medical doctors, new officers must begin as second lieutenants (O-1). Because of this closed system, as we have pointed out in the previous chapter (see Figure 1.3.), eligibility criteria play a crucial role in determining the racial/ethnic and gender makeup of the eligible population, and this, in turn, shapes the demographic profile of Air Force officers.

The population eligible for military service is quite different from the general U.S. population. To become an Air Force officer, individuals must meet age and health requirements, and they must go through a commissioning program that requires completion of a college degree. These requirements disqualify different groups at different rates. In addition, they must be willing to join, and there are also racial/ethnic and gender differences in preferences for military service. Thus, it would be unreasonable to expect that the Air Force should perfectly mirror the general population. Rather, a better expectation would be to mirror the racial/ethnic and gender distributions of a population that meets eligibility requirements.

In this chapter, we construct population benchmarks that the Air Force can use to assess the demographic diversity of their accession cohorts. These population benchmarks also help explain the differences between the demographic profiles of Air Force officers and the U.S. population. We also examine intention for military service, as a proxy for willingness, to offer another benchmark.

This report focuses on line officers, as opposed to non-line officers such as medical officers, judge advocate general officers, and chaplains.<sup>7</sup> Line officers make up about 80 percent of total Air Force officers. We use eligibility criteria for line officers in constructing the population benchmarks. The data provided for new officer cohorts also include only line officers, as do the data in later chapters. Additionally, the eligibility requirements discussed here correspond best to eligibility for commissioning via Reserve Officer Training Corps (ROTC) or Officer Candidate School (OTS) as opposed to via the U.S. Air Force Academy (USAFA), which requires additional hurdles for admission generally involving both high school grades and standardized test scores.

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<sup>7</sup> For the purposes of this analysis, non-line officers differ from line officers in several important ways. First, eligibility criteria for non-line officers vary among the non-line fields and differ from line officer criteria. Second, accession is a different process in some non-line fields because officers enter the Air Force at higher ranks. Third, non-line officers compete in different promotion boards from line officers. Fourth, non-line officers have authority only within their specialty, in contrast to line officers, who have general command authority and therefore greater influence. Finally, line officers become more common in higher pay grades, and diversity among the most senior leaders motivates this study (line officers comprise approximately 309 of the 315 general officers).



## Constructing Officer Benchmarks from Nationally Representative Data

The general approach for this analysis is to use nationally representative survey data to estimate the proportion of each racial/ethnic and gender group that is ultimately eligible to join the Air Force. Though there are many specific eligibility requirements, survey data are available for only a few of the major disqualifying factors.<sup>8</sup> There are some additional requirements, such as limits on criminal background and drug use, on which no reliable national data exists. Table 2.1 summarizes the criteria this analysis used to construct the eligible population based on nationally representative datasets.

**Table 2.1. Criteria Used to Construct Eligible Population**

Characteristic	Applicant Is Ineligible When
Age	Younger than 18 or older than 34
Education	Not a college graduate
Citizenship	Not a U.S. citizen
Body composition	Not within the Air Force height/weight requirements
Medical	Has asthma, diabetes, heart disease, or a disability

SOURCE: Air Force Recruiting Service Instruction (AFRSI) 36-2001, *Recruiting Procedures for the Air Force*, April 1, 2005, Incorporating Through Change 3, October 25, 2011; and Air Force Instruction (AFI) 48-123, *Medical Examinations and Standards*, September 24, 2009, Incorporating Through Change 2, October 18, 2011.

### *Approach and Data Availability*

If complete data on all requirements were available in a single nationally representative dataset, the probability that an individual in any racial/ethnic and gender group meets two requirements could be determined according to the rules of conditional probability:

$$P(A, B | R, G) = P(A | R, G)P(B | A, R, G)$$

where A and B are any two generic requirements, and R and G are the race/ethnicity and gender of the individual. This formula could easily be expanded to include any number of requirements.

Unfortunately, no dataset has all the pertinent information on military eligibility on a single set of individuals, so our analysis assembled estimated probabilities from several different data sources. The 2010 American Community Survey (ACS) serves as the baseline for population estimates in this analysis because it has the biggest sample size (over 3 million individuals). Among other things, it includes information on age, education, and citizenship.

The 2010 Behavioral Risk Factor Surveillance System (BRFSS), conducted by the Centers for Disease Control and Prevention, contains information on height, weight, and the various

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<sup>8</sup> Additional eligibility criteria that can disqualify potential recruits include vision requirements, an aptitude test, felony convictions, drug use, and other medical requirements.



medical conditions used in this analysis. The survey includes individuals age 18 and up and also includes limited information on education, race/ethnicity, and gender.

Table 2.2 summarizes the eligible requirements, available survey variables, and the data sources that we used.

**Table 2.2. Summary of Conditional Probabilities and Data Sources for Eligible Population**

Requirement	Conditional On	Data Source
Age = 18-34	Nothing	ACS 2010
Education = BA/BS+	Age	ACS 2010
Citizenship = US	Age, Education	ACS 2010
Body composition = meet AF Requirements	Age, Education	BRFSS 2010
Medical = no asthma, diabetes, heart cond., or disability	Age, Education, Body Composition	BRFSS 2010

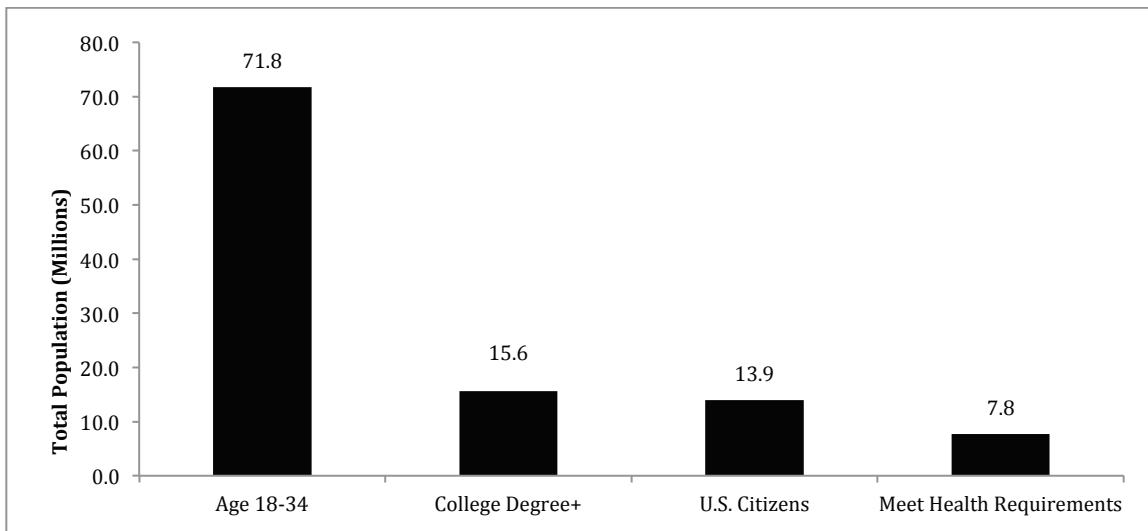
NOTE: "Eligible population" is defined by AFI 48-123 (2011) and AFRSI 36-2001 (2011).

## Comparing Air Force Accession Cohorts to Eligible Population

Figure 2.1 shows the number of people that meet each eligibility requirement. The requirements are cumulative, so each bar represents the population that meets the respective requirement and all previous requirements (i.e., all requirements to the left). We calculated these separately for each racial/ethnic and gender subgroup and then summed.

While nearly 72 million people meet the age requirement for being commissioned as second lieutenants, the vast majority, 56.2 million, do not possess a college degree. This requirement reduces the eligible population to 15.6 million individuals. U.S. citizenship and health requirements further reduce the eligible population to 7.8 million individuals.

**Figure 2.1. Population Eligible to be Air Force Officers Based on Selection Requirements**

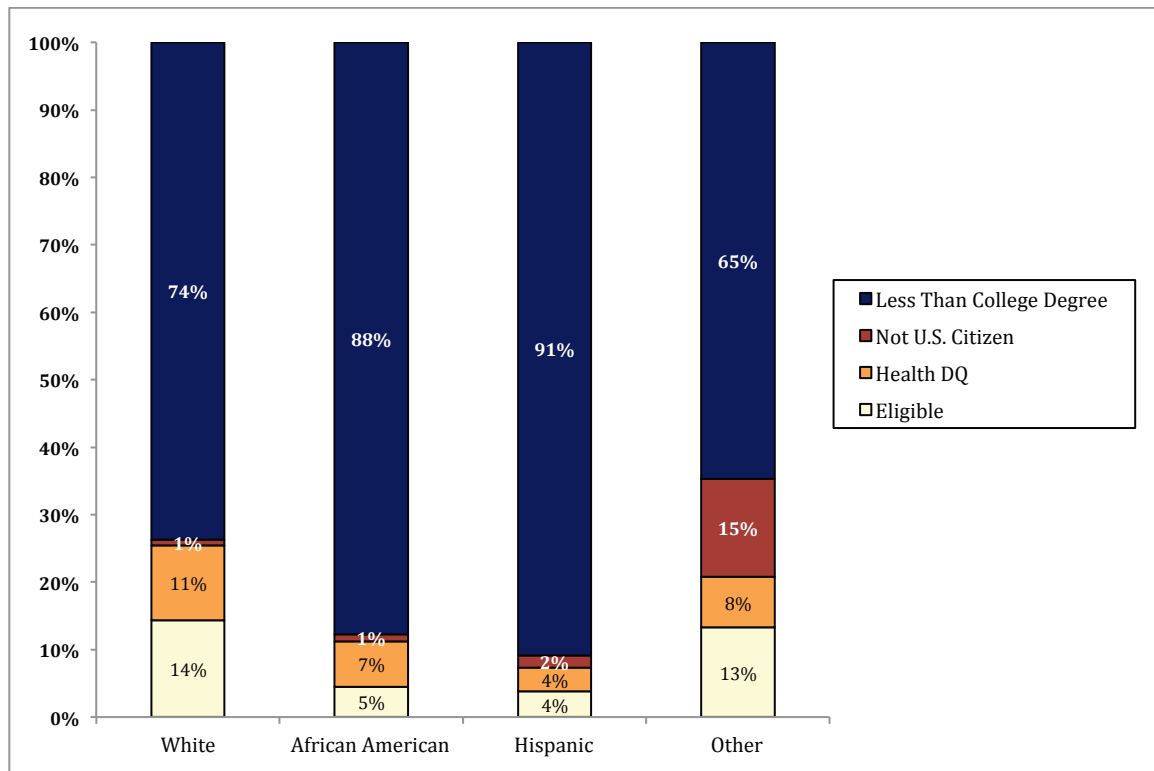


SOURCE: Authors' tabulation of ACS 2010 and BRFSS 2010 data.

### *Eligibility Among Racial/Ethnic Groups*

While the requirements apply equally to all demographic groups (in this sense, they are racial/ethnic- and gender-neutral), the rates at which individuals can meet these requirements vary across demographic groups. To the extent that there are differences between the degree to which different groups meet the eligibility requirements, we would expect the demographic profile of the eligible population to differ from the general U.S. population. Figure 2.2 shows the disqualification rates for each officer requirement by race/ethnicity.

**Figure 2.2. Disqualification Rates for Officer Requirements by Race/Ethnicity**



SOURCE: Authors' tabulation of civilian survey data.

The requirements are applied in order from top to bottom, and the bottom bar is the final eligibility rate. For example, 74 percent of the white population age 18–34 does not meet the education requirement. After they are eliminated, an additional 1 percent of the white population is disqualified due to the citizenship requirement. An additional 11 percent meet all but the health requirements (body composition and medical eligibility). Thus, the remaining 14 percent of the white population is eligible for enlistment.

African Americans and Hispanics are much less likely than whites and the “other” racial/ethnic group to meet all the requirements, in large part because of the college degree requirement. Those in the “other” racial/ethnic group include all other races/ethnicities, including Asians, Pacific Islanders, and Native Americans. While those in the “other” racial/ethnic group were the least likely to be disqualified by the education requirement (65 percent), the additional requirement of U.S. citizenship disqualifies a substantial margin of members of this group who have college degrees, lowering their overall eligibility rate to 13 percent (slightly below the rate for whites). Hispanics also have a high rate of noncitizenship. However, because rates of college completion are so low among Hispanic noncitizens, this group was mostly considered ineligible by the education requirement before the citizenship requirement came into play. This is an artifact of the order of criteria in the analysis, not a substantive result. Overall, whites and other race/ethnicities meet eligibility requirements at around three to four times the rate of African

Americans and Hispanics. The absolute numbers for Figure 2.2 are given in Table 2.3 for a sense of scale.

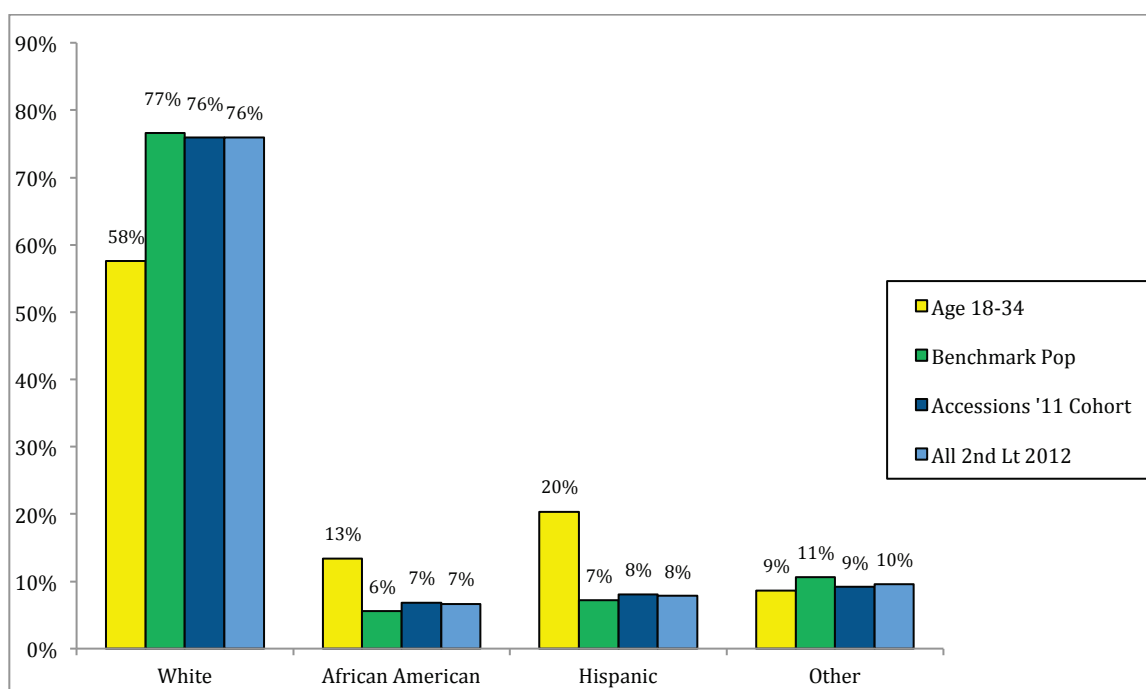
**Table 2.3. Disqualification Numbers for Officer Requirements by Race/Ethnicity, in Thousands**

	White	African American	Hispanic	All Other
Disqualified: Less than college degree	30,436	8,435	13,277	4,022
Disqualified: Not U.S. citizen	368	103	263	904
Disqualified: Health	4,569	648	513	468
Eligible	5,936	434	556	826

### *Racial/Ethnic Benchmark Comparisons*

Figure 2.3 shows the racial/ethnic distribution of the total population age 18–34, the eligible population, the entire officer accession cohort for calendar year 2011, and a snapshot of Air Force second lieutenants in April 2012. Both the accession cohort and the second lieutenant cohort include only line officers.

**Figure 2.3. Air Force Line Officers and Eligible Populations, by Race/Ethnicity**



SOURCE: Authors' tabulation of Air Force and civilian survey data.

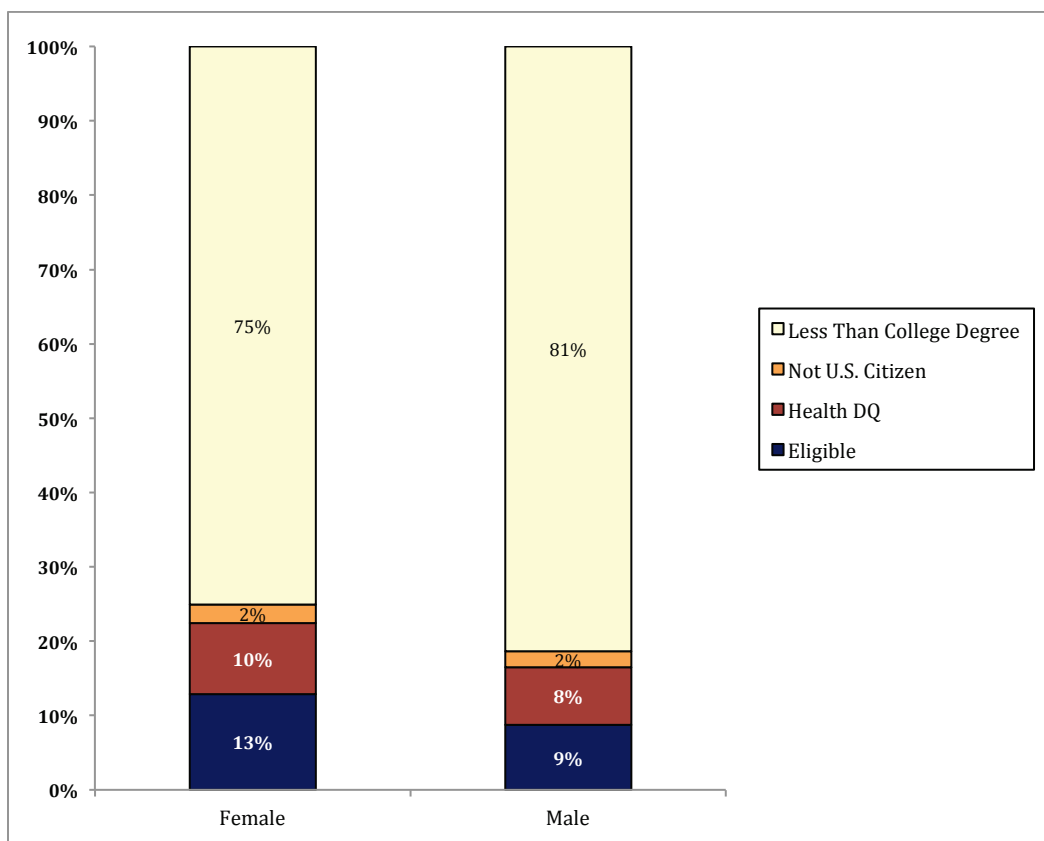
The racial/ethnic distribution of the 2011 accession cohort very closely mirrors the benchmark population. In most cases, there is virtually no difference between the two groups. Though the 2011 accession cohort has very small proportions of African Americans and

Hispanics, these numbers are consistent with the portion of the population of each group that is eligible to serve as an Air Force officer. These results indicate that the Air Force is matching the levels of racial/ethnic diversity expected by the eligible population.

### *Eligibility Differences by Gender*

Much as requirements disqualify members of different racial/ethnic groups at different rates, there are also gender differences in eligibility for commissioning. Figure 2.4 shows the disqualification rate for each requirement and the final eligibility rate, by gender.

**Figure 2.4. Disqualification Rates for Officer Requirements by Gender**



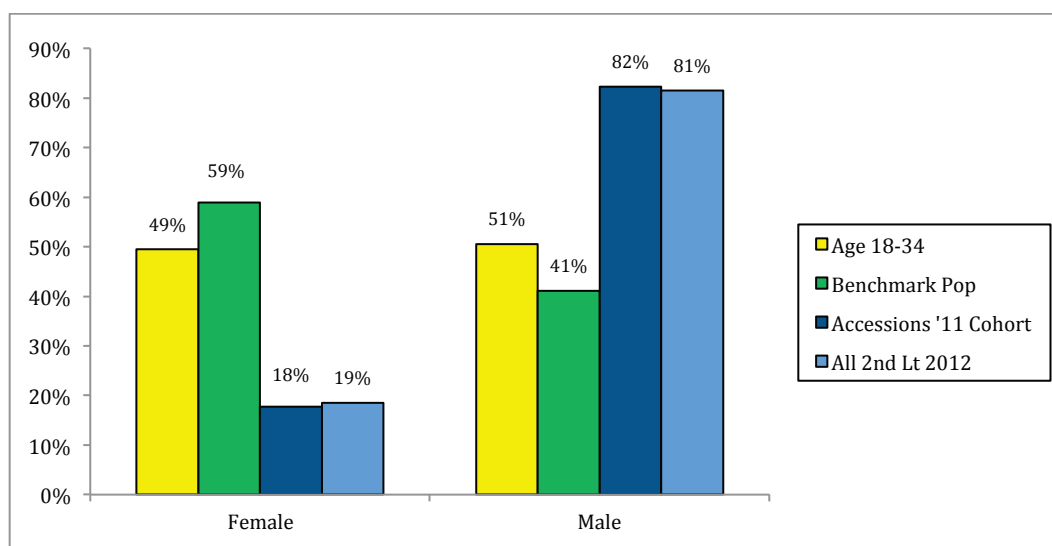
SOURCE: Authors' tabulation of civilian survey data.

However, unlike the racial/ethnic differences, this analysis shows that women actually have a higher final eligibility rate (13 percent) than men (9 percent), because women are more likely to have college degrees. Therefore, based on eligibility alone, the Air Force should have a *higher* proportion of women than their proportion among 18–34-year-olds indicates.

## Gender Benchmark Comparisons

There is a pronounced difference in gender distribution between the 2011 officer accession cohort and the benchmark population. Figure 2.5 shows this comparison; as in Figure 2.3, each pair of colored bars sums to 100 percent. This gender gap does not appear to be driven by any of the major requirements. Women actually make up a higher percentage of the eligible population than the actual population, due in large part to their higher rates of college graduation.

**Figure 2.5. Gender Comparison of Air Force Line Officers and Benchmark Population**



SOURCE: Authors' tabulation of Air Force and civilian survey data.

## Intentions for Military Service Impact the Eligible Population

To this point, the analysis has focused on how explicit eligibility requirements impact the racial/ethnic and gender makeup of Air Force personnel. In the era of the all-volunteer force, an implicit requirement in the recruiting process is that individuals must be willing to serve in the armed forces, in addition to meeting the explicit eligibility requirements. Much as eligibility rates differ by demographic group, so do preferences for military service. This differential preference for military service could significantly shape the pool of potential recruits. Indeed, data show that different intentions toward joining the military go a significant way toward explaining why there are so many fewer junior officers are women than are men, despite higher eligibility rates among women.

In this section, we explore this question of intention to join the military with data from *Monitoring the Future: A Continuing Study of American Youth* (Johnston et al., 2011), conducted by the University of Michigan's Institute for Social Research. The data, collected in 2010, include a nationally representative sample of high school seniors. The survey asks respondents, "How likely is it that you will serve in the armed forces after high school?" For this analysis, we

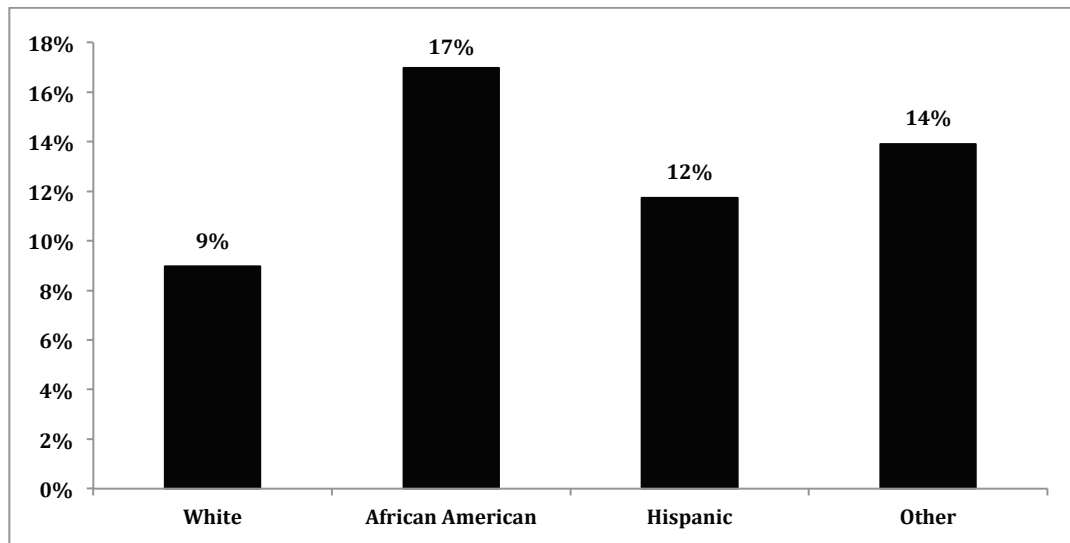
consider anyone who answered “probably will” or “definitely will” as preferring to serve. In addition, the survey asks, “How likely is it that you will graduate from college after high school?” In this analysis, we use those who answered “probably will” or “definitely will” to estimate the preference rates for officers.

This is a crude measure of actual preferences. Commissioning only occurs after completion of college: High school seniors’ responses to what they “probably will” do four years or more in the future is an imprecise measure for what they actually end up doing. (Exceptions would include students who have already been accepted into commissioning programs, but these are likely a small minority of respondents.) However, these data can still serve as a rough proxy for how preference varies by race/ethnicity and gender.

Research has shown that intention to enlist is associated with enlistment, although the link is weaker among women. The Department of Defense Youth Attitude Tracking Study asks 16–21-year-olds questions similar to questions in *Monitoring the Future*. Among men who expressed the most intention to enlist, 31 percent did go on to enlist in the next five years, compared with only 6 percent of men who expressed that they did not intend to enlist. Only 18 percent of women who expressed the most intention to enlist went on to enlist, compared with 1 percent of women who expressed that they did not intend to enlist. This led researchers to conclude that “simple comparisons of positive intention rates may overstate women’s interest in enlisting relative to men’s interest in joining the military” (Orvis, 1986, p. vi). For all recruits, the ultimate decision of whether or not to serve is based on the alternatives they are faced with at the time of recruitment and accession. Better understanding of these alternatives at the point of decision is needed.

Figure 2.6 shows the percentage of each racial/ethnic group that reported they “probably will” or “definitely will” serve in the armed forces. African Americans responded that they are likely to serve in the armed forces at the highest rate of all racial/ethnic groups (17 percent for those likely to attend college). More generally, all minority groups are more likely than whites to prefer military service.

**Figure 2.6. Preferences for Military Service by Race/Ethnicity**



SOURCE: Authors' tabulation of data in Johnston et al., 2011.

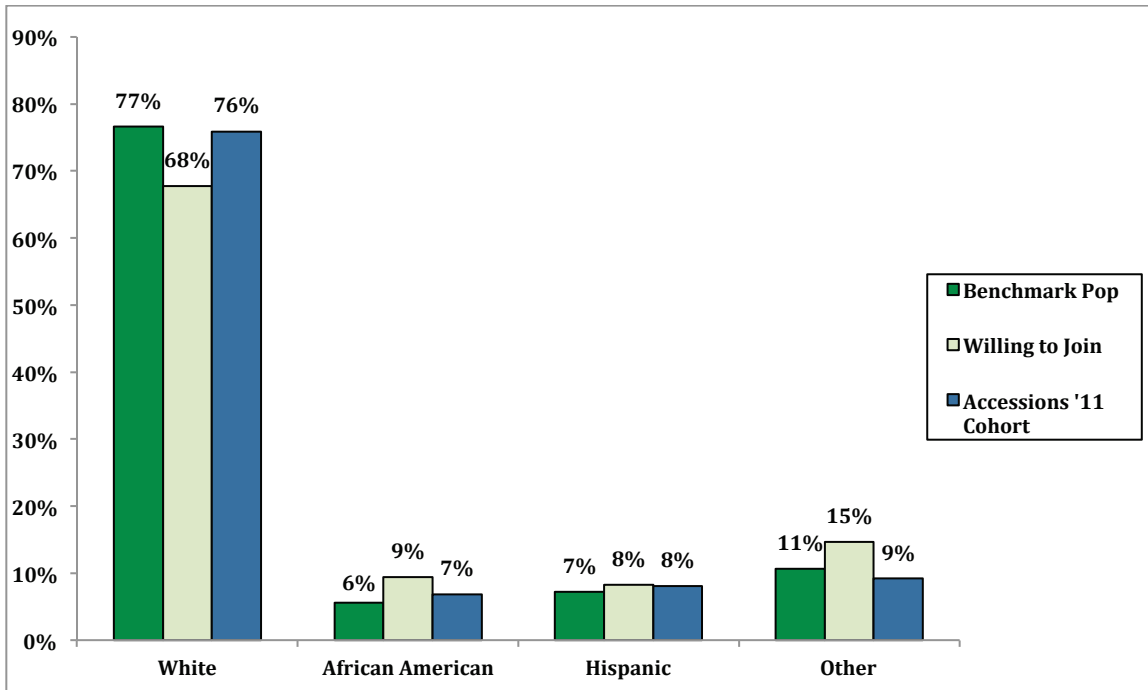
Since willingness to join the military is an implicit requirement, the rates of intention to serve can be treated like an additional requirement for the eligible population to assess its relevance for racial/ethnic differences in the officer corps. Given that the racial/ethnic distribution of the eligible population closely mirrored the 2011 cohort, one would expect that accounting for the higher intention to serve among minorities would reveal an underrepresentation of minorities in the officer accession cohorts. As Figure 2.7 shows, this does happen to some degree, particularly among the African American and “other” groups. The intend-to-join bars in Figure 2.7 reflect the proportion by race/ethnicity of the youth population that is both eligible to join and intends to join.<sup>9</sup> The most recent accession cohort’s low proportion of African Americans and Hispanics was in line with the explicit eligibility requirements. In contrast, this comparison shows that, given higher intentions for service among African Americans, one should actually expect a higher proportion of African Americans than what is seen in the 2011 cohort.

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<sup>9</sup> This assumes that eligibility is independent from intention to join after conditioning on race/ethnicity for the set of students who intend to graduate from college. Because eligibility and intention may be somewhat correlated, this analysis may overstate the influence of intention to serve.



**Figure 2.7. Race/Ethnicity Comparison of Air Force Line Officers Versus Eligible Population and Eligible and Intentional Population**

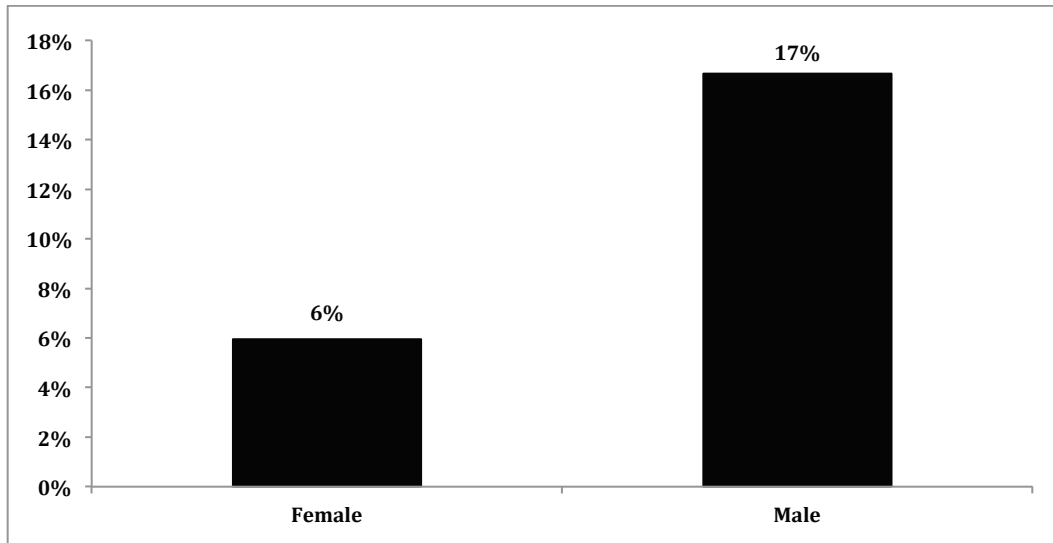


SOURCE: Authors' tabulation of Air Force and civilian survey data.

There are several possibilities for the lower-than-expected proportion of African Americans among new Air Force officers. Outreach to minorities may be ineffective or more appealing options outside of the Air Force (including joining other services) may exist by the time youth graduate from college. Another possibility is that modeled eligibility requirements do not fully capture actual eligibility requirements for commissioning. For instance, using a different set of requirements to model eligibility for the USAFA, Schulker (2009) found substantially lower minority representation than among the ROTC/OTS eligible group than is shown here. This was due to the standardized test scores generally required for USAFA admissions: There are also standardized test score requirements for commissioning via ROTC or OTS, but they tend to be much lower and we were not able to model them here.

Figure 2.8 shows the percentage of each gender that “probably will” or “definitely will” serve in the armed forces. As shown, men prefer military service at much higher rates than women. Only 6 percent of women likely to attend college respond that they will probably serve in the military. Thus, for every woman interested in joining the military, there are almost three men interested.

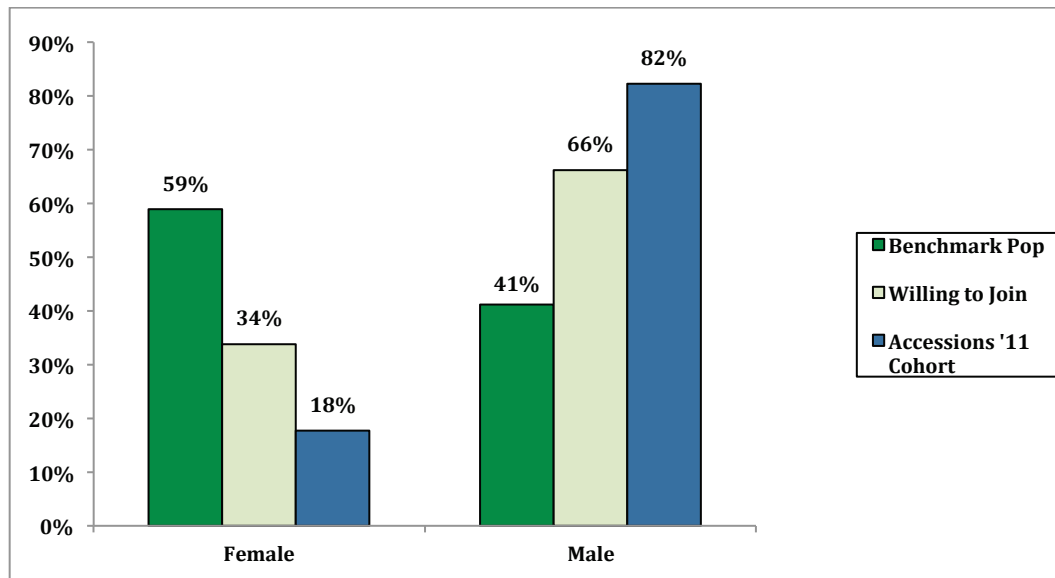
**Figure 2.8. Preferences for Military Service by Gender**



SOURCE: Authors' tabulation of data in Johnston et al., 2011.

Figure 2.9 shows the gender distributions of the officer benchmark population, the population that is intending to serve in the military, and the 2011 officer accession cohort. Different intentions for service account for a large portion of the gender gap between the eligible population and the most recent officer accession cohort. However, the estimated differences in intention are not big enough to explain the entire gap. This may be at least partly because the measurement of intention is crude and because the relationship between intention to join the military and actually joining the military is weaker among women than men (Orvis, 1986).

**Figure 2.9. Gender Comparison of Air Force Line Officers Versus Eligible Population and Eligible and Intentional Population**



SOURCE: Authors' tabulation of Air Force and civilian survey data.

## Summary

The Air Force differs from civilian organizations in that its executive leadership—the officer corps—almost exclusively enters the organization as second lieutenants, the lowest grade. Lateral entries at higher grades are generally restricted to non-line officers. Individuals must meet specific requirements to become an Air Force officer. For instance, an individual must be a healthy college graduate and a U.S. citizen and meet specific height and weight standards. Among these major requirements, we found that the majority of American youth cannot meet the educational and medical/body composition requirements.

In addition, members of different demographic groups meet the accession requirements at different rates. Hence, the general population is not a suitable benchmark to assess the demographic diversity of the Air Force's officers. We applied the major Air Force accession requirements to nationally representative datasets to construct a benchmark that is more suitable to assess the demographic diversity of Air Force officer accessions.

We found that the racial/ethnic makeup of Air Force accessions closely mirrors the makeup of the eligible population; the Air Force is bringing in the same level of racial/ethnic diversity as the eligible population. Therefore, we can conclude that most of the racial/ethnic differences between the Air Force accessions and the general population are explained by the fact that some minority groups tend to meet Air Force eligibility requirements at lower rates. This presents a challenge for the Air Force, because it does not control the factors (i.e., those underlying education, health, and citizenship) contributing to these different rates of meeting eligibility requirements.

In contrast, women are more likely to meet the eligibility requirements for becoming an officer, since a higher proportion of women graduate from college. Thus, the gender differences between the Air Force officer corps and the general population are not easily attributable to accession eligibility requirements. In fact, the gender differences would actually be bigger if the eligible population were used as a benchmark.

Including intentions for military service in the calculations alters the benchmarks in different directions across demographic groups. Though the benchmark population's racial/ethnic composition was initially very similar to recent accession cohorts, minority intentions for service reveal potential gaps between the Air Force and the eligible population, because racial/ethnic minorities have higher intentions for military service than whites. In contrast, differences in intentions for service significantly reduce the gender gaps between the eligible population and recent officer accessions.

These findings have direct implications on outreach and recruiting strategies. The military has some ability to alter peoples' intentions for military service, as shown in the literature about the effect of advertising on enlistment. For instance, Dertouzos (2009) shows that military advertising from 2002 to 2004 increased the overall proportion of black and Hispanic enlistees in the armed services.

The MLDC (2011b) reported several possible ways to increase the representation of minorities and women among officers, including advertising and increased ROTC presence at heavily minority colleges. There are legal limits to the degree to which the military is allowed to use demographic information in recruiting. However, the MLDC pointed out that developing goals for qualified minority applicants are legal and should be encouraged. More research is necessary to identify policies that would be both effective and cost-effective in terms of increasing representation of minorities and women among new accession cohorts.

### 3. Accessions and Retention

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Accessions, development, promotion, and retention all play critical roles in shaping the demographic profile of Air Force senior leaders. Officer accessions are the entry of new officers into the Air Force, and officer development is the training and growth of officers as they progress through the ranks. Officer promotions are based on the Air Force decisions about whether to advance officers into higher ranks, while officer retention is based on the decisions by officers about whether to remain in the Air Force. Those who are not promoted may be required to leave under certain circumstances, but other officers who have remained past their contractual years of obligation decide whether or not to remain. Force-shaping policies can affect the rates of each of these processes and can also indirectly affect racial/ethnic and gender diversity. For instance, since different career fields have different demographic makeups, policies which affect some career fields more than others can affect the demographic diversity of the overall officer corps. In this analysis, we focus on the officer-level mechanisms that affect diversity (accessions, promotion, and retention).

The closed pyramid structure of the officer corps provides one entry point, with fewer and fewer positions at higher ranks, making accessions the cornerstone upon which force diversity is erected. With few exceptions, new officer recruits enter as second lieutenants. If new officers are not diverse, it would be difficult, and likely impossible, for the Air Force to achieve diversity in its higher grades even with unrestricted access to development programs, a promotion system blind to ethnicity and gender, and retention rates equalized across different groups.

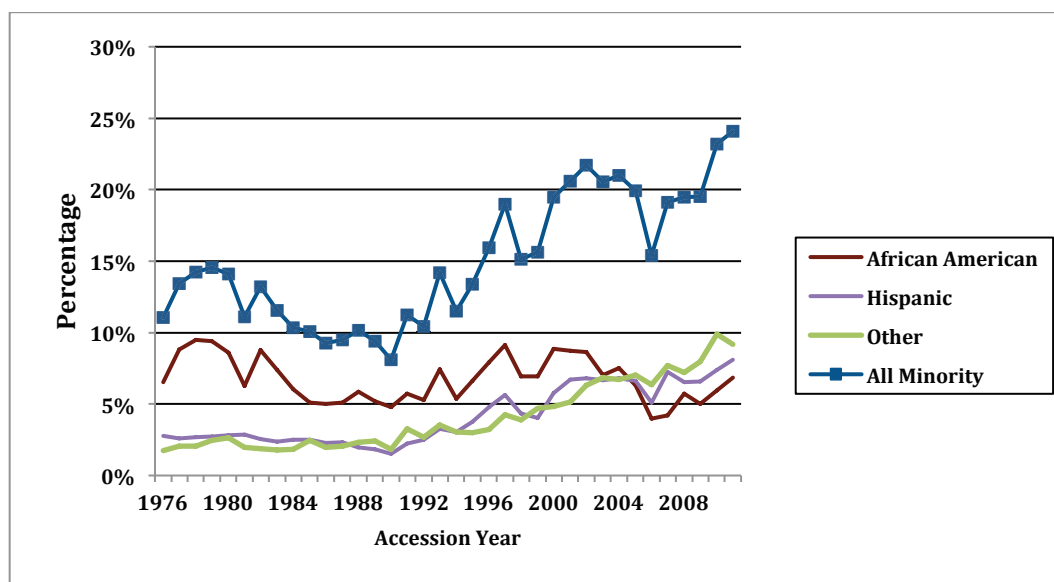
As shown in the previous chapter, the population from which the Air Force can recruit its officer corps does not mirror the general population. The military has set requirements for age, education, citizenship, and health, all of which limit the population eligible to serve in the Air Force officer corps. This restricted population does not share the same racial/ethnic and gender distributions as the general population. While the composition of the ascending Air Force officer corps will not mimic the general population, we would expect the incoming cohort to more closely resemble the demographic profile of the eligible and intending-to-serve population, assuming that the recruitment and decisionmaking process has been relatively similar across groups.

#### Accession Cohorts over Time: Minorities

Figure 3.1 illustrates the racial/ethnic percentage of accession cohorts from 1975 to 2011. There has been a general upward trend in the percentage of each cohort that is non-white, due primarily to growth in Hispanic and Asian American accessions. Taken together, minorities represented roughly 24 percent of all 2011 accessions, up 14 percentage points relative to the 1975 cohort;

this reflects a relative increase of 140 percent since 1975. This upward trend in the Air Force parallels upward trends in the general population: The proportion of racial/ethnic minorities among U.S. 18–34-year-olds also increased significantly during that period, from 22 percent in 1980 to 42 percent in 2010.

**Figure 3.1. Minority Representation in Recent Air Force Line Officer Accession Cohorts, 1975–2011**

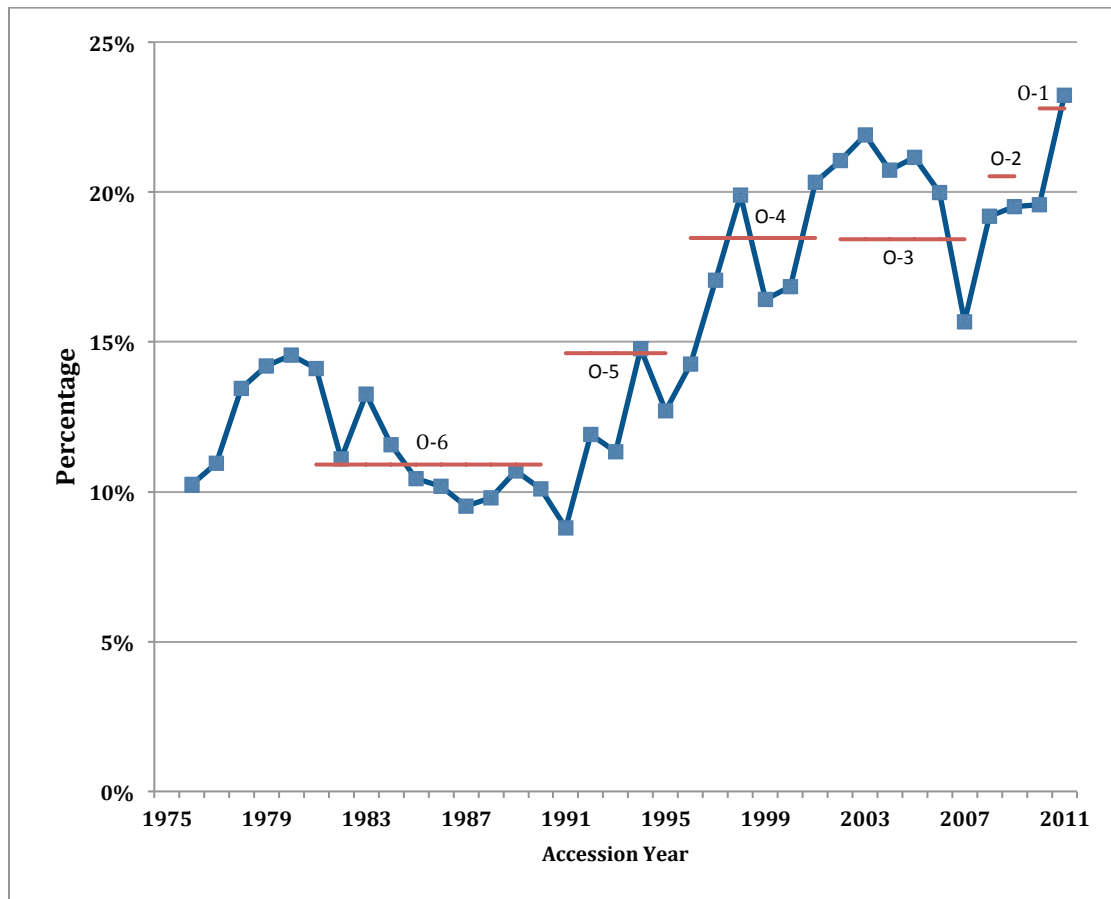


SOURCE: Authors' tabulation of Air Force data.

Figure 3.2 again shows the overall minority accession rates for the 1975–2011 cohorts. In addition, the current fraction of minorities in each rank is plotted for groups of cohorts (horizontal lines in Figure 3.2). For instance, the individuals who joined the Air Force between 1998 and 2002 would be expected to hold the grade of major (O-4) as of 2012, and minorities represent roughly 18 percent of all Air Force majors (shown as the horizontal line labeled “% O-4” in Figure 3.2). Minority representation among majors approximately mirrors the diversity of their corresponding accession year groups. This pattern holds for all grades through colonel.

It is important to note that unlike what we observed for high pay grades (O-4 and above), minority representation among captains (O-3) is significantly lower than their corresponding accession cohorts. About 20 percent of accessions between 2003 and 2005 were minorities, yet the percentage of minorities among O-3 labeled “% O-3” is only 18 percent. This gap is primarily due to recent force-shaping efforts by the Air Force to meet its end strength. Voluntary and involuntary force management programs tend to disproportionately affect the retention of officers in support career fields, in which minorities are more concentrated.

**Figure 3.2. Minority Representation in Recent Air Force Line Officer Accession Cohorts and Current Grades, 1975–2011**



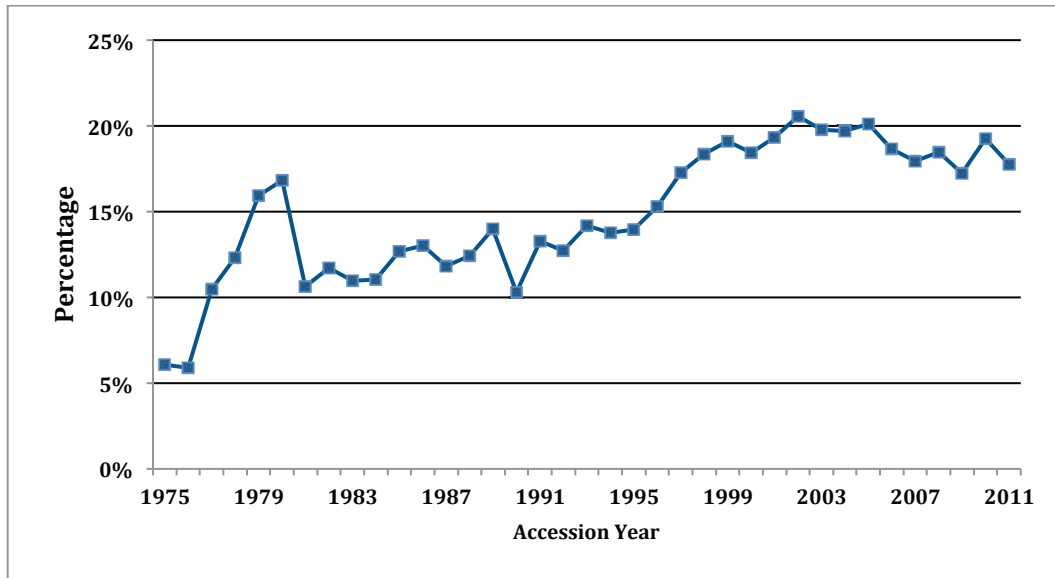
SOURCE: Authors' tabulation of Air Force data.

Figure 3.2 shows the success of the Air Force in retaining its racial/ethnic minority officers by presenting the close association between racial/ethnic diversity of accessions and racial/ethnic diversity of higher pay grades. This close association reflects the fact that there is little difference in retention between minority and white officers, especially after controlling for their career fields. We computed additional retention measures, including continuation rate and cumulative continuation rates for racial/ethnic groups across different career fields, and the results reinforce the conclusion we can draw from Figure 3.2, that the retention of white and racial/ethnic minority officers is similar after controlling for their career fields.

### Accession Cohorts over Time: Women

Similar to the analyses by race/ethnicity above, Figures 3.3 and 3.4 illustrate the proportion of recent cohorts composed of women, as well as their representation in current grades. Gender diversity among accessions has also increased significantly, from 6 percent in 1975 to 18 percent in 2011. This represents a relative increase in women of 200 percent during this period.

**Figure 3.3. Representation of Women in Recent Air Force Line Officer Accession Cohorts, 1975–2011**



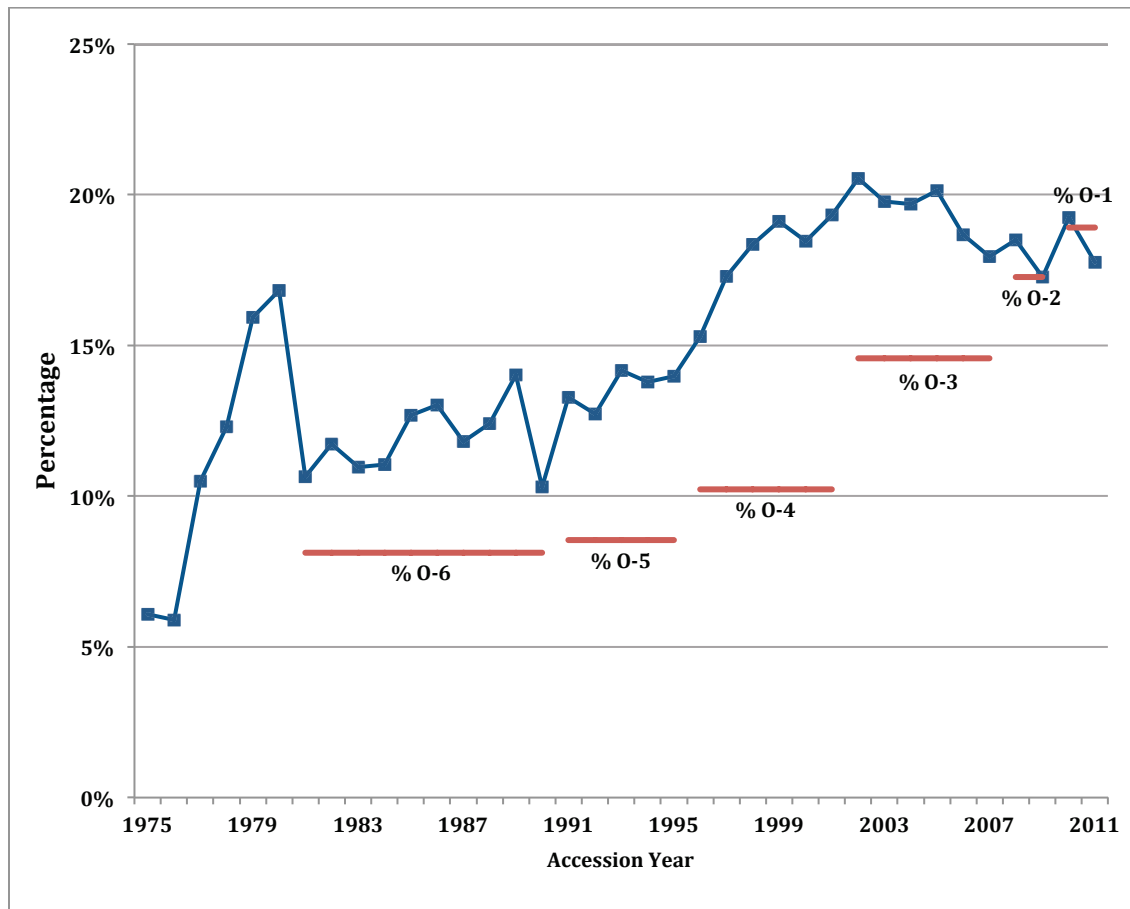
SOURCE: Authors' tabulation of Air Force data.

Unlike minorities, however, the fraction of women in each pay grade is generally lower than the fraction in corresponding accession year groups. The gaps grow significantly larger in higher pay grades. For instance, 17–18 percent of the 2008 and 2009 accession year groups were women. They represent 18.5 percent of all first lieutenants (labeled “% O-2”). The year groups that currently hold the grade of major were 15–19 percent women, but only 10 percent of all current majors are women (labeled “% O-4”). At the highest end of the line officer spectrum, 8 percent of colonels are women, but the 1981–1990 year groups were comprised of between 10 and 14 percent women (labeled “% O-6”). Therefore, women are significantly underrepresented in higher pay grades relative to corresponding year groups.<sup>10</sup>

<sup>10</sup> This is well established by other research as well. See, for example, MLDC, 2010.



**Figure 3.4. Representation of Women in Recent Air Force Line Officer Accession Cohorts and Current Grades, 1975–2011**



SOURCE: Authors' tabulation of Air Force data.

## Explaining the Lower Rates of Retention Among Female Officers

One hypothesis for the lower rate of retention among women relative to men is officers' family decisions differing by gender. If, compared with men, women leave active duty in disproportionate numbers in order to have children, concentrate on raising young children, or care for dependent elder family members, then their retention will be lower. Additionally, the military is a particularly demanding employer: Compared with many civilian employers, it offers a demanding work schedule and limited control over time away, hours of work, location choice, and location stability. In this section, we examine how much differences in demographic characteristics (including marital status and number of dependent children, but not including elderly dependents or caretaking responsibilities) and career characteristics explain why observed aggregate retention rates among women in the officer corps are lower than those of men.

### *Methodology: Doubly Robust Estimation*

If the demographic and career characteristics examined do actually explain why women's retention rates lag behind men's, then a hypothetical set of men in the officer corps with the exact same demographic and career characteristics observed among the women in the officer corps would experience the same retention rates as the women. The retention rates of that hypothetical group of men are called the female counterfactual outcomes; i.e., they are the retention rate outcomes that we would expect to see among women in the officer corps if they were, in fact, men with otherwise identical records. The goal of the analyses in this section is to estimate the retention rates of that hypothetical set of men and observe whether it significantly differs from the observed rates for women. Finding such differences would indicate that the demographic and career characteristics examined do not fully explain why women's retention rates differ from their male counterparts. We conduct these analyses for each year of service (YOS) completed, from 1 to 20 YOS. We consider each YOS separately, for two reasons: (1) Initial commitments to service will suppress differences across gender that may arise later in an officer's career, and (2) we do not want to assume that the relationship between gender and retention is static from year to year, as that may mask important differences over the course of officers' careers.

To conduct these analyses, we use a statistical technique known as doubly robust regression (Bang and Robins, 2005; Kang and Schafer, 2007). The doubly robust estimation combines two statistical methods: propensity score methods (Rosenbaum and Rubin, 1983) and more traditional regression methods. Both methods are aimed at removing potential confounding factors from the comparison of retention between men and women. We provide a heuristic discussion of this methodology below, and a more detailed discussion may be found in Appendix A.

The process involves three steps. In the first step, we create a comparison group of men that look as similar as possible to the women on all the relevant career and demographic characteristics, including commission source, career field, marital status, and family characteristics.<sup>11</sup> This is accomplished by modeling the probability that an officer with a given set of observed characteristics is a woman. These estimated probabilities, called propensity scores, are then used to weight each observed man in the officer dataset, such that men with characteristics more similar to women, or those with the higher propensity scores, receive a higher weight in the analyses (see appendix A for additional details on how the weights are constructed). When gender differences exist among these characteristics, dissimilar men provide little predictive power regarding the retention decisions of women, and their full inclusion risks disproportionate leverage on the range of characteristic values that are rarer among women when conducting a traditional regression analysis. The end result of the weighting process is the

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<sup>11</sup> Some of these characteristics may be endogenous to retention, e.g., the decision to marry may be related to the decision to remain in the Air Force.

creation of a comparison group of men that looks as similar as possible to the observed women on the distribution of each characteristic of interest. We estimated propensity scores using generalized boosted models (Ridgeway, Madigan, and Richardson, 1999), a flexible nonparametric technique that iteratively captures the relationship between a set of officers' characteristics and officers' gender with less bias than traditional linear logistic regression (McCaffrey et al., 2004; Ridgeway and McCaffrey, 2007). We estimated propensity scores separately for each YOS to optimize each comparison.

Table 3.1. shows how the propensity score method produces a weighted comparison officer group of men whose characteristics are similar to women. (Table 3.1 shows only three characteristics among officers with eight years of service (YOS) as an example.) For example, among those with eight YOS, Table 3.1 shows that men are more likely to have graduated from USAFA (22 percent) than are women (12 percent), yet the propensity-weighted men are equally likely to have graduated from USAFA (12 percent). Similarly, officers have different distribution across marital status by gender. For instance, by the 8th YOS, 4 percent of men are divorced, while 12 percent of women are divorced. Using propensity weights, we constructed a weighted comparison group of men with a similar distribution across marital status.

**Table 3.1. Distribution of Selected Characteristics by Gender and Counter-Factual Groups of Air Force Line Officers at 8 Years of Service**

	Observed Men	Observed Women	Weighted Men
<b>Source of commission</b>			
USAFA	22%	12%	12%
OTS	24%	18%	18%
ROTC	42%	34%	34%
Other	13%	36%	35%
<b>Marital status</b>			
Divorced	4%	12%	13%
Married to a service member	41%	47%	47%
Married to non-service member	41%	18%	18%
Single	14%	23%	23%
<b>Number of children</b>	1.12	0.63	0.62

NOTE: Some categories may not add up to 100 percent due to rounding.

The propensity score method is an effective way to construct, among these officers, a comparison group of men with similar characteristics as the women. However, small differences in characteristics can remain between the comparison group and the women (see, for example, the proportion divorced in Table 3.1). In the second step of our analysis, the doubly robust estimation method reduces the potential bias due to these remaining differences using a regression model. In the case of retention, we use a weighted linear logistic regression to estimate the probability of retention, where male observations are weighted as per the propensity

scoring process discussed above (and women receive a weight of one full observation). In the model, we again control for the observed officer demographic and career characteristics and also include an indicator for gender. If the estimated regression coefficient for gender differs from zero in this model (i.e., is statistically significant), that indicates that the demographic and career characteristics being considered do not fully explain why the retention outcomes of women differ from those of men in the officer corps.

While the coefficient for gender provides an indication of whether retention differences across gender remain after accounting for the characteristics being considered, because we are using a logistic regression model, the coefficient does not directly inform the magnitude of a significant difference. So, in the final step of the analysis, we use the fitted linear regression model to estimate that difference. To do so, we first recode the observations of women as men and observe their estimated outcomes from the fitted model, along with the standard errors of those estimates. Note that recoding the women in the dataset as men produces the hypothetical set of male officers that we are interested in (those with the exact same demographic and career characteristics observed among the women), and their estimated outcomes are an estimate of the female counterfactual outcomes. If the weighted logistic regression model indicates that a significant difference in gender retention rates still exists after accounting for the relevant characteristics, an estimate of the magnitude of that difference is obtained by comparing the observed proportion of women retained to the estimated proportion of the hypothetical comparison group of men retained; i.e., by comparing the retention rates of women to the estimated female counterfactual rate.

### *Differential Retention Among Officers by Gender*

We measure retention as the probability that a line officer on active duty at the beginning of a fiscal year is still on active duty at the end of the fiscal year. The proportion of officers who remain at the end of the fiscal year is referred to as the *continuation rate*. Continuation rates vary by years of service (Warner, 2006). Therefore, we estimate retention separately for each year of service. These are *conditional continuation rates*; for example, the continuation rate for officers with three years of service measures the proportion of officers with three years of service that remains in the Air Force for a fourth year of service.

We also compute *cumulative continuation rates* (CCRs), defined for each year of service as the probability that an officer at accession will remain in the Air Force through that year of service. These data are not continuation rates for any single accession cohort, but rather are estimates for *synthetic cohorts*. Synthetic cohorts combine data from all year groups in a limited time period to simulate what retention behavior would be if a cohort were to behave like individuals in the measured time period.

We use retention data from fiscal years 2001 to 2011 in order to focus on recent retention patterns in the Air Force. Averaging retention over multiple fiscal years smooths out

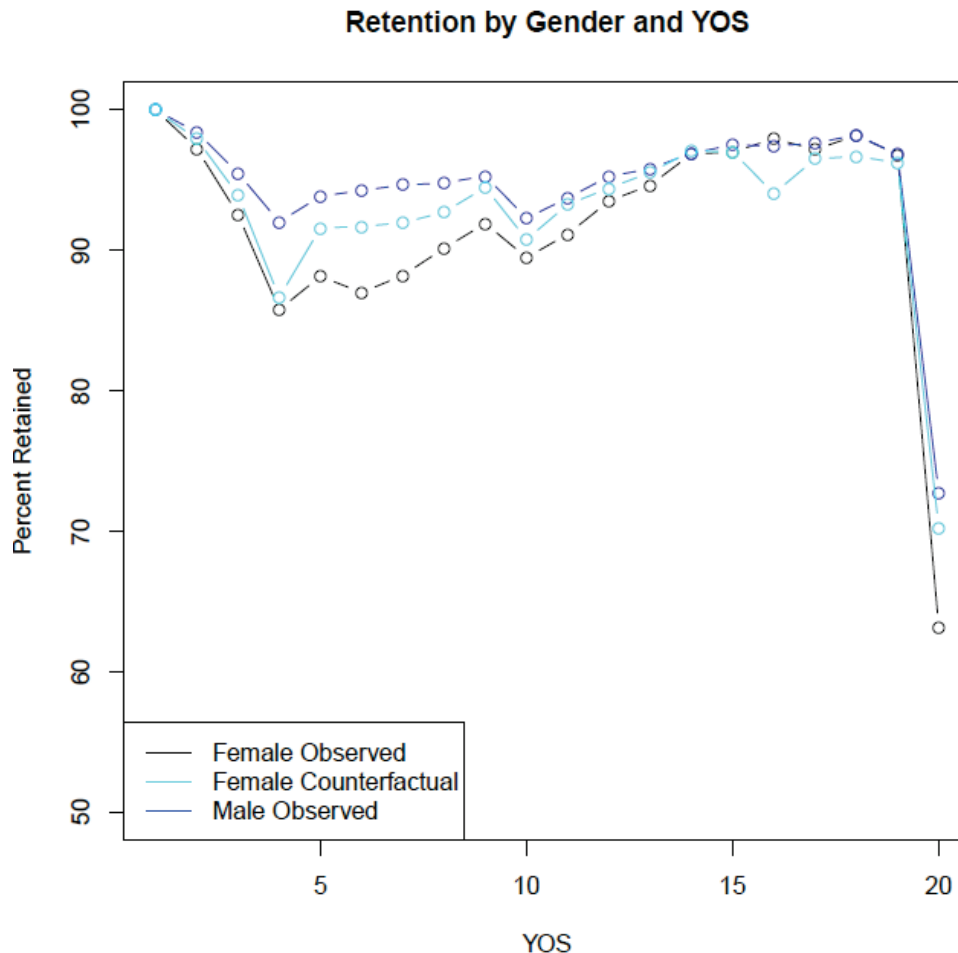
continuation rates and helps to ensure that our focus is on general patterns rather than potentially anomalous behavior in any single year.

Figure 3.5 displays, by YOS, continuation rates for officers by gender. For both men and women, the data in Figure 3.5 show well-known retention patterns that reflect institutional constraints of the military system. Continuation rates are very high during an officer's initial service obligation, after which they notably decline. Once an officer reaches the 12th YOS, continuation rates exceed 93 percent for women and 95 percent for men. The conventional wisdom is that this is the point at which military retirement benefits become a significant lure for officers (Asch and Warner, 1994). Continuation rates at the 20th YOS, however, drop dramatically, to 72 percent for men and 63 percent for women. In other words, of the officers who become vested in the retirement system, over one quarter of men, and one third of women, leave the Air Force immediately.<sup>12</sup>

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<sup>12</sup> Asch and Warner (1994) note that “beyond the 20-year mark, officers appear to postpone their separations until they fail selection to the next rank.”

**Figure 3.5. Air Force Line Officer Continuation Rates, FY01–FY11**



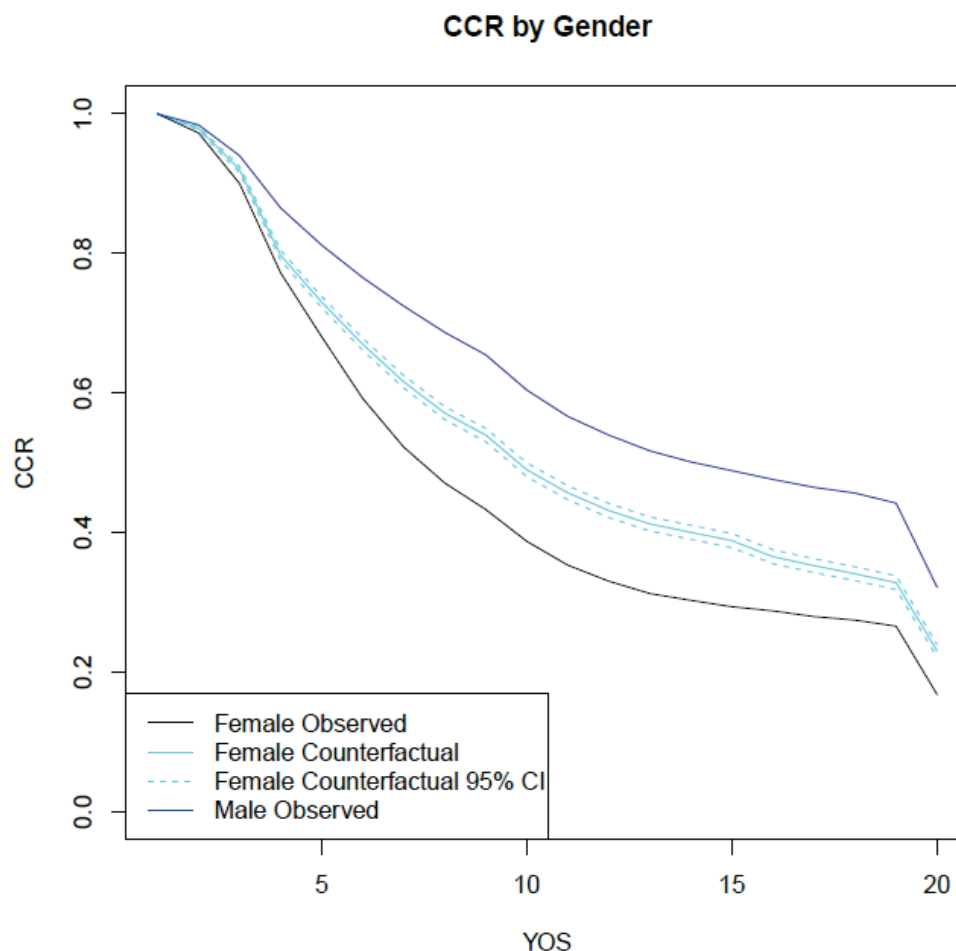
SOURCE: Authors' tabulation of Air Force data.

As Figure 3.5 shows, there are notable differences in men's and women's continuation rates. Through the first 14 years of service, continuation rates for women are always lower than those for men. The gap between men's and women's retention is largest between the 5th and 7th YOS, with men's continuation rates between 3 and 5 percentage points higher than those of women. Once officers reach the 11th YOS, the gap between men's and women's continuation rates narrows, and in the 15th through the 19th YOS, women's retention rates are higher than men's until the point at which they become vested in the military retirement system. As discussed above, women are more likely than men to separate immediately after becoming vested. In fact, the difference between men's and women's retention is at its largest (9 percentage points) at the 20-year point.

It is relatively straightforward to convert the continuation rate data from Figure 3.5 into CCRs for men and women. These data are displayed in Figure 3.6, which shows that men's retention is appreciably higher than women's throughout the career. For example, by the 5th YOS, about 72 percent of accessions among men in the officer corps are still in the Air Force,

compared with only about 67 percent of accessions among women. This early attrition, before officers have finished serving out their initial contracts, is being driven by the Air Force shaping the size of the force (e.g., retirement incentives). By the 12th YOS, about 43 percent of men, and only about 33 percent of women, still remain. In other words, by the 12th YOS, the cumulative continuation rate for women is about 75 percent of the CCR for men.

**Figure 3.6. Air Force Line Officer Cumulative Continuous Rates by Gender, FY01–FY11**



SOURCE: Authors' tabulation of Air Force data.

### *Officer Characteristics and Differential Retention Among Officers*

So far we have concentrated on observed trend lines for men and women in Figure 3.5 and 3.6. The third line in each graph, named “female counterfactual,” shows our estimate of what continuation would be for a hypothetical set of male officers with the same characteristics (or distribution) of demographic and career variables as the actual women officers. In other words, the female-counterfactual line provides an estimate for the women if they were instead men but otherwise had their same records. These variables include marital status, race/ethnicity, number

of dependent children, rank, occupation, and source of commission. While not exhaustive, these observable characteristics capture in a general way major career and family differences among officers. As an illustrative example, descriptive statistics of these characteristics by gender prior to weighting for officers with five YOS are shown in Appendix B.

Figure 3.5 and Figure 3.6 show that in the earlier part of Air Force officer careers, much of the lower retention among women does appear to be associated with this set of characteristics. In other words, men who “look the same,” in terms of characteristics such as occupation and number of children, as the average woman in the officer corps also leave the Air Force at close to the same rates as those women. However, the explanatory value of these characteristics appears to diminish between the 5th and the 9th YOS. Between the 9th and 11th YOS, the observed retention rates between men and women grow closer together than in earlier years, but gender very much dominates nongender characteristics in terms of the degree to which each explains differences in retention that are observed. This is shown by the fact that the observed women line remains below the female counterfactual line. In contrast, between the 16th and 18th YOS, although the continuation rates for observed men and women are quite similar, women retain at a significantly higher rate than similar male officers, including by as much as 4.6 percentage points at the 16th YOS.

As Figures 3.5 and 3.6 show, demographic and occupational characteristics can explain some of the gaps between women’s and men’s retention rates in some years. These other characteristics *partially*, but not completely, explain differences in men’s and women’s officer retention. The unexplained portion may be due in some part to the family or career characteristics having different impacts on officer retention by gender, for example, because women are more often the primary caretakers of their children than men are.<sup>13</sup>

### *Differential Retention Among Civilians by Gender*

Is the differential impact of gender on retention unique to Air Force officers? To answer this question, we compare officers’ gender differences in retention trends with civilians, accounting for other observable characteristics of civilians using the doubly robust estimation method. Specifically, we focus on an individual’s marital status, race/ethnicity, number of children, and whether they work for the government or in the private sector. The comparison is limited, as an officer who is leaving an Air Force is not only leaving an employer but also terminating a career, and it is difficult to measure when a civilian changes his/her career; it is easier to identify when a civilian leaves his/her employer.

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<sup>13</sup> Between the 12th and 15th YOS, and again at 19th YOS, the differences between women’s observed and estimated counterfactual continuation rates are not statistically distinguishable. Between the 2nd and 4th YOS, estimated differences are statistically significant due to a very large sample size, but lack practical significance. Statistical significance was determined using a 15 percent false discovery rate adjustment for multiple testing (Benjamini and Hochberg, 1995).



We use the National Longitudinal Survey of Youth (NLSY) 1979 to examine retention rates of employed civilians. The longitudinal nature of the NLSY data allow us to examine the extent to which civilians remain with the same employer from one year to the next, a metric analogous to the *continuation rate* used by the military services. (Again comparison is limited, since unlike the Air Force officers, these workers can return to the same employer in a later date.) We use the NLSY79 data, a nationally representative sample of individuals who were 14 to 22 years old when first surveyed in 1979. These individuals were interviewed each year from 1979 to 1994, and have been interviewed every other year since 1994.

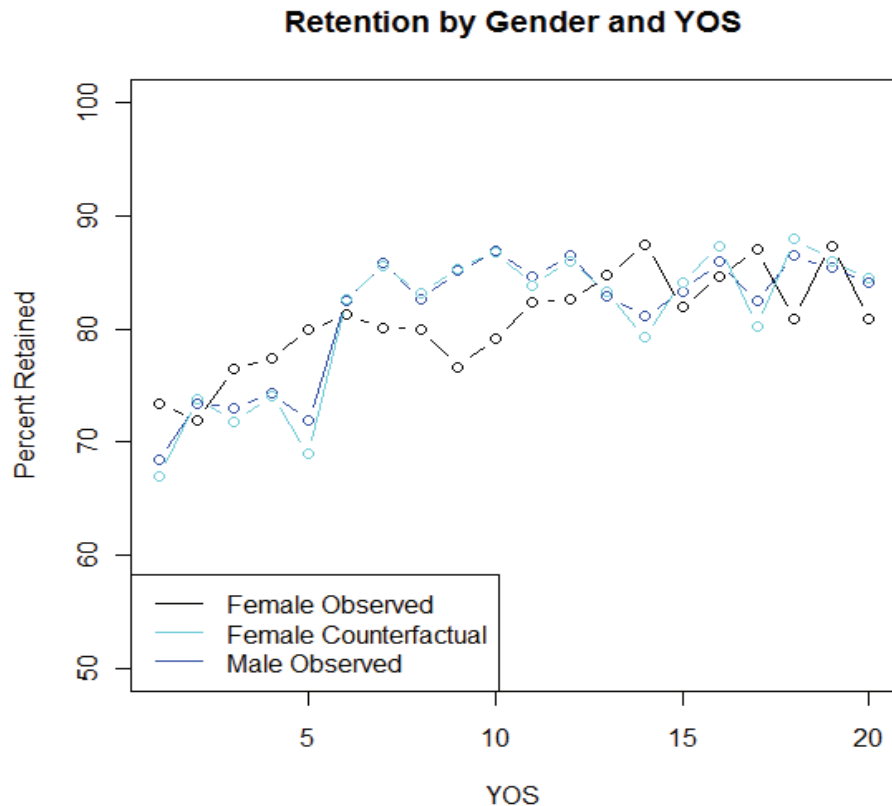
In order to focus on civilian women that are most comparable to Air Force officers, we impose two restrictions on the data. First, we focus on women who have attained a bachelor's degree or higher. Second, when measuring retention and changes in labor force participation, we focus on women working full-time in civilian jobs.<sup>14</sup>

Figure 3.7 shows that there are gender differences in leaving one's employer in the civilian labor force. For instance, in earlier years in their tenure (from 2 to 5 years), women are more likely to remain with their employers; yet women are less likely to stay with their employers from 7 to 12 years compared with their male counterparts. As demonstrated by the "Female Counterfactual" line in Figure 3.7, differences in family and career characteristics have no ability to explain the difference in retention patterns for men and women. Therefore, we must conclude that unlike among the Air Force officers, these other observable characteristics explain none of the differences in retention between civilian men and women. In other words, we find that retention among civilian workers differs by gender: men and women in civilian jobs behave differently when their family and career characteristics are similar. This may stem in part from relative limitations in observable data for civilians compared to observable data for Air Force officers, since we don't have the same degree of specificity in the civilian data.

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<sup>14</sup> The Bureau of Labor Statistics classifies employed individuals as full-time workers if they work at least 35 hours per week.

**Figure 3.7. Actual and Adjusted Continuous Rates by Gender Among Civilians**



SOURCE: Authors' tabulation of NLSY data.

## Summary

We documented a general upward trend in the percentage of each cohort that is non-white, due primarily to growth in Hispanic and Asian American accessions. All minorities together represented roughly 24 percent of all 2011 accessions, up 14 percentage points relative to the 1975 cohort. Similarly, gender diversity among accessions has increased significantly, from 6 percent in 1975 to 18 percent in 2011, and it has increased without a corresponding increase in the population at large (as is the case for racial/ethnic diversity).

While representation of non-whites across pay grades mirrors their proportion of accession year groups from which the grades are drawn, women are significantly underrepresented in higher pay grades compared with corresponding year groups. Therefore, lower retention rates among women in the officer corps play a significant role in shaping the gender profile among senior leaders of the Air Force.

We attempted to isolate root causes of gender differences in officer retention rates by constructing a comparison group of men who have similar characteristics as women. We found that in the earlier part of Air Force officer careers, much of the lower retention rate among

women does appear to be associated with a set of observable characteristics, including marital status, race/ethnicity, number of dependent children, rank, occupation, and source of commission. In other words, gender differences in retention rates among young officers can be explained by differences in their demographic and career characteristics. However, the explanatory value of these characteristics appears to diminish among more experienced officers.

Therefore, we observed that demographic and occupational characteristics can explain some of the gaps between men's and women's retention rates in some years. These other characteristics *partially*, but not completely, explain differences in officer retention by gender. This unexplained portion may be due to career or family characteristics having a differential impact on officer retention by gender or to other, unobserved factors.

As a comparison, we examined the retention rates between civilian men and women. We find that there are gender differences in leaving one's employer in the civilian labor force. However, none of the difference between men's and women's retention rates is explained by differences in family and career characteristics. Therefore, we conclude that, unlike among the Air Force officers, these other observable characteristics explain none of the differences between civilian men's and women's retention at any career stage. Additional research that compares retention between Air Force officers and other branches of the military, other industries with high geographic mobility (e.g., the Foreign Service), and other industries that are male-dominated (e.g., police and fire departments) could explain this dynamic further.

## 4. Promotions

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There are two research questions that this chapter will address:

1. Is a line officer who is a member of a racial/ethnic minority or a woman any less or more likely to be promoted than an equally situated line officer who is white or a man?
2. Which characteristics differ along racial/ethnic or gender lines and are also important to promotion?

We address these questions in order below.

We answer the first question by statistically adjusting (among line officers) the characteristics of whites and men so that they are comparable to minorities and women, and then comparing their promotion probabilities. If statistically significant and large racial/ethnic or gender gaps exist in the probability of promotion after rigorously controlling for relevant differences in observable characteristics and experiences, then it would appear that something unobserved about the system (presumably relating to race or gender) presents a barrier to equal opportunity. We then examine the second question with a statistical model of promotion itself as a function of individual characteristics that could relate to promotion. The model identifies which characteristics are most strongly related to promotion.

### Differences in Promotion by Race/Ethnicity and Gender

#### *Methodology: Doubly Robust Regression*

To test whether there are racial/ethnic and gender differences in the probability of promotion, we use the same propensity score–weighted doubly robust regression technique used in the previous chapter (Bang and Robins, 2005; Kang and Schafer, 2007; see Appendix A for additional detail). In the absence of promotion differences attributable to race/ethnicity or gender, a minority officer should have the same probability of promotion (or of a promotion recommendation) as a nonminority with the exact same record. The goal is to estimate the officer promotion outcomes of members of a racial/ethnic minority or of women to those of a hypothetical set of non-Hispanic whites or men, respectively, with the exact same characteristics, such as commission source, order of merit, experience, background, technical abilities, assignment history, performance, awards, career field characteristics, and prior promotion outcomes, and then to examine whether unexplained differences in the promotion outcomes exist after accounting for these characteristics. The characteristics of interest for this comparison are those that may be influential to the promotion process or correlated with positive promotion outcomes. We specifically consider all such metrics that are available in the observed officers' personnel records, as well as select USAFA outcomes when appropriate, that are quantifiable such that they

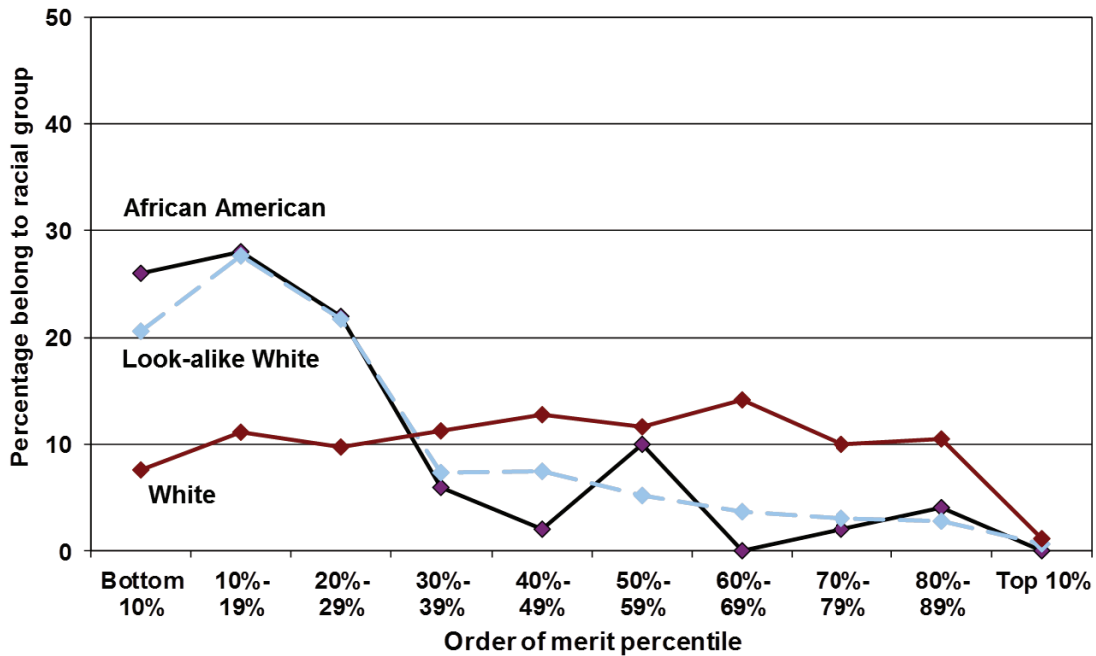
may be included in our statistical models (see Appendix B, Table B.2, for a list of characteristics considered).

For each racial/ethnic or gender comparison of interest, we use the same process executed in the prior chapter to carry out the doubly robust regression analyses. Here we provide a heuristic description complementary to the discussion in the prior chapter, with a more detailed discussion in Appendix A. For simplicity, we describe the process for a generic minority group (a racial/ethnic minority or women) and comparison group (non-Hispanic whites or men).

In the first step, we model the probability of being a member of the minority group given the observed characteristics, i.e., the propensity of being a minority, and use those results, called propensity scores, to weight the comparison group such that their weighted distribution on all the observed characteristics look as similar as possible to the minority group. This process produces weights for the comparison that are greatest for those comparison observations that are most similar to the minority group and down-weights the observations of those in the comparison group that tend to be dissimilar to the minority group. We refer to this weighted comparison group as the “look-alike” group below. We estimated propensity scores using generalized boosted models (Ridgeway, Madigan, and Richardson, 1999), a flexible nonparametric technique that iteratively captures the relationship between a set of officers’ characteristics and officers’ gender with less bias than traditional linear logistic regression (McCaffrey et al., 2004; Ridgeway and McCaffrey, 2007).

To illustrate the propensity weighting process, Figure 4.1 plots the distribution of USAFA order of merit percentile by race/ethnicity for officers meeting colonel promotion boards. USAFA order of merit is a USAFA ranking based on the weighted average of academic, military, and athletic performance. We show order of merit here as deciles. For example, officers who graduated from the USAFA and whose order of merit scores when they graduated were among the bottom 10 percent of their class fell into the “Bottom 10%” point in Figure 4.1. Those who graduated at the top of their class, i.e., whose order of merit scores were higher than 90 percent of their classmates, fall into the “Top 10%” point. More white officers in the data are in the higher order of merit percentiles, meaning white officers (the red line) tended to graduate higher. However, the weighted white officers (the dotted, light blue line) have a distribution of order of merit percentiles that is similar to the African American officers. Thus, comparing the African American officers to the weighted white officers allows underlying differences in order of merit to not contaminate the comparison because the two groups have comparable order of merit distributions.

**Figure 4.1. USAFA Order of Merit, by Race, Among Line Officers (1998–2005)**



In the same way, we weighted the white (male) officers to be similar to the various racial/ethnic (gender) groups for each comparison for all metrics for which quantitative data were available. However, as seen in Figure 4.1, small differences may remain after weighting. As in the previous chapter, in the second step of our analysis we reduce the potential bias due to these remaining differences using a regression model. More specifically, we use weighted logistic regression to estimate the probability of the promotion outcome of interest, where comparison observations are weighted as per the weights derived from the propensity scoring model. The weighted logistic regression model includes all available characteristics as well as an indicator as to whether each observation belongs to the minority group. A regression coefficient for this minority group indicator that differs significantly from zero would indicate that a difference between minority and nonminority outcomes still exists after accounting for all the available characteristics.

Finally, to estimate the promotion outcomes of a hypothetical group of comparison officers who are identical to the minority officers on all the observed characteristics, we recode the minority officers to be in the comparison group and predict their promotion outcomes from the fitted logistic regression model; i.e., we estimate the counterfactual outcomes of the minority group. The difference between the observed minority outcomes and their estimated counterfactual outcomes provides an estimate of the direction and magnitude of any significant differences.

## *Race/Ethnicity and Gender Comparisons*

The promotion process involves the timeline for promotion, the commander's recommendation, and the promotion decision. The timeline for promotion for most cases is the typical year that a person would be up for promotion, known as "in the promotion zone" (IPZ). Sometimes, officers are suggested for promotion one or even two years early, known as "below the promotion zone" (BPZ); this is typically for officers with very strong records.<sup>15</sup> A commander's recommendation is the final recommendation for promotion given to each officer facing a promotion board. For most cases, this is a recommendation of "promote." A limited number of officers receive a recommendation of "definitely promote" (DP); this is an official designation that is supposed to be for the top-performing officers. Finally, there is the promotion decision itself, which is made by a promotion board for all officers up for promotion to major, lieutenant colonel, and colonel—a separate board for each rank.

This analysis examined three principal promotion outcomes for racial/ethnic or gender differences: whether officers received a recommendation of "definitely promote," whether officers were ultimately selected for promotion, and whether officers without a "definitely promote" recommendation were ultimately selected for promotion. We chose to break out officers without a "definitely promote" recommendation for separate selection outcome analyses to account for the possibility that the relatively high selection rate of those with the "definitely promote" recommendation could mask important racial/ethnic or gender differences among the remaining officers. We did separate comparisons for individuals BPZ and IPZ, for each grade to be selected (major,<sup>16</sup> lieutenant colonel, and colonel), and separately for USAFA graduates and non-USAFA graduates. In addition, among African Americans who did not go to USAFA, we did a single comparison for all non- USAFA African Americans *and* separate comparisons for the group that went to historically black colleges and universities (HBCUs) and those who did not. Combining these distinctions with the four races/ethnicities (African American, Hispanic, Asian American, and Native American) and one gender (women) made for 120 separate comparisons between a particular race/ethnicity or gender and "look-alike" whites or men.

## *Multiple Testing Considerations*

When conducting multiple simultaneous hypothesis tests, the chances of a false positive finding are greatly increased. Traditional adjustments call for lowering the threshold for any one test so that the probability of a false finding among any of the tests, the family-wise error rate, is at the desired level, typically 5 percent. We instead take a more liberal approach of controlling for the expected number of false discoveries (called the false discovery rate; Benjamini and Hochberg,

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<sup>15</sup> Less commonly, officers who were turned down for promotion in the zone face a promotion board again, known as "above the promotion zone" (APZ). This situation encompasses too few cases to include as a separate outcome; thus, APZ selections are not considered in this chapter.

<sup>16</sup> BPZ promotions were not available for selection to major.

1995), setting that value at 15 percent. In other words, we are allowing for the chances of a greater number of individual comparisons being labeled as statistically significant. In this analysis, we are ultimately concerned with the overall functioning of the officer promotion board system with respect to racial/ethnic and gender equity; false discovery rate adjustments are well suited for systematic evaluations based on multiple inferences (Benjamini and Hochberg, 1995), as they allow for greater power to identify individual comparisons as significant. In this case, a very small number of significant cases out of the total would point to a lack of systematic bias, and the false discovery rate adjustment allows for a more liberal test in that it admits more cases as significant.

## ***Results***

Of the 120 comparisons between minorities/women and “look-alike” whites/men, eight comparisons yielded statistically significant gaps. This means that in over 93 percent of the groups we compared, we found no evidence of differential promotion outcomes, suggesting that systematic bias is not present in the Air Force’s promotion system. Those situations that did show different outcomes for different groups are listed in Table 4.1, along with the group that each gap favors, the outcome, the promotion zone, the racial/ethnic or gender group of interest, and the commissioning source.

These comparisons account for all characteristics for which quantitative data metrics were available (see Appendix B for a comprehensive listing of metrics included in these models). To the extent that statistically significant unexplained gaps remain, such gaps could either be real group differences or attributable to factors not accounted for in the model.

There are several potentially important characteristics for which metrics were not available for these analyses. For example, we were not able to include stratification given to individual officers by superiors in their chain of command (e.g., rater, senior rater, or commander of the organization). The stratification given to officers reflects their relative rating of job performance compared with their peers. There are other ways in which superior officers (rater and senior rater) express their qualitative assessment of officers’ performance. The level of enthusiasm of officer performance reports by superior officers is an important qualitative indicator for the promotion boards. Moreover, when a superior officer enthusiastically “pushes” an officer for professional military education opportunities and/or command positions, the superior officer enhances the subordinate officer’s promotion probability. Other contextual factors that can influence promotion probability may be missing in our models as well. For example, the organizational setting of an officer’s place of work can influence his or her promotion probability. These organizational settings include working directly for a senior general officer, being in a professional military education residence program, and working in a strategically critical organization, such as Joint Chief of Staff on Promotion Recommendation Form accounting date. Therefore, we cannot simply infer that the “unexplained” gaps we found are indicators of discriminatory practices in the promotion system.



**Table 4.1. Unexplained Gaps by Gender and Race/Ethnicity in “Definitely Promote” and Selection for Promotion Among Line Officers**

Outcome	Zone	Group	Rank	Source	Unexplained Gap
Selected (P)	IPZ	Women	Major	USAFA	Favors Women
Selected (All)	BPZ	Women	Colonel	USAFA	Favors Men
DP Award	IPZ	African Americans	Major	Non- USAFA	Favors Whites
DP Award	IPZ	African Americans	Lt. Colonel	USAFA	Favors Whites
DP Award	IPZ	African Americans	Lt. Colonel	HBCU	Favors Whites
Selected (All)	IPZ	African Americans	Colonel	Non- USAFA, Non-HBCU	Favors Whites
DP Award	IPZ	Hispanics	Colonel	USAFA	Favors Whites
Selected (All)	BPZ	Hispanics	Colonel	Non- USAFA	Favors Whites

NOTE: Selected (P) outcomes exclude DP awardees.

In 30 comparisons with “look-alike” men, we found two significant unexplained gaps. Both of these occurrences involved USAFA graduates. Women’s selection rate for on-time promotion (IPZ) to the rank of major among non-DP candidates was higher than expected, while women’s selection rate for early promotion (BPZ) to colonel was lower than expected. The remaining 28 comparisons showed no significant differences in promotion outcomes between women and look-alike men.

Of the 60 total comparisons between African Americans and “look-alike” whites, four continued to have an unexplained gap, and in all of these the gap favored whites. African American officers were significantly less likely than “look-alike” white officers to be awarded DP in three of the comparisons. In one additional significant gap, African American officers were less likely than “look-alike” whites to be selected for colonel, among those who did not graduate from the USAFA or an HBCU.

Finally, “look-alike” whites were favored over Hispanics in two of 30 comparisons. One significant gap was for early selection (BPZ) to colonel among non–USAFA graduates, and the other was for award of a “definitely promote” designation among USAFA graduates on-time (IPZ) for colonel.

The look-alike analysis indicates that women and men and racial/ethnic minorities and whites face the same promotion outcomes the vast majority of the time, once differences in background, technical abilities, assignment history, performance, awards, career field characteristics, and commissioning source are taken into account. Exceptions remaining after conditioning on available quantitative metrics include 7 percent of comparisons for each of women, African Americans, and Hispanics.

## Career Success Is Cumulative

### *Methodology: Generalized Boosted Models*

In addition to the comparisons of promotion by race/ethnicity and gender, we analyzed each outcome, by grade, to identify the characteristics most strongly related to promotion. To model the binary outcome of promoted/not promoted, we use a form of nonparametric statistical classification. The alternative standard parametric application would be to use logistic regression to model the probability of a positive outcome as a transformed linear function of standardized independent variables. The regression estimates the parameters of the linear function and then assesses these parameters according to their magnitude and statistical precision. Rather than assuming a linear functional form, *ex ante* we use a generalized boosted model (GBM; Ridgeway, Madigan, and Richardson, 1999) to fit a more flexible functional form to the data. The GBM is an automatic algorithm that solves for the optimal functional form through thousands of iterations—each adding a function “piece” that best explains the remaining variation in the data. After the iterations have finished, the function that best fits the data can be used to determine which variables have the greatest overall impact on the probability of promotion. In sum, instead of simply fitting a linear logistic regression and reporting the size of the coefficients, we use boosting to determine a better-fitting (but much more complex) functional form and report which variables have the biggest impact on selection overall.

### *Results: Most Influential Characteristics on DP (Definitely Promote) Award and Promotion*

Table 4.2 shows the top ten most influential variables (and their signs) for promotion to the grades of major, lieutenant colonel, and colonel (for USAFA graduates facing a promotion board on time). Since receiving a DP award is consistently one of the most important variables in promotion, Table 4.3 shows the top ten most influential variables on the probability of receiving a DP recommendation. Some predictors are common for both outcomes and/or across all the ranks, such as detractors and academic and military orders of merit, while others are unique to a rank, such as joint staff experience. Highlighted variables are those that are potentially affected by policy.

The variables identified in each column of Tables 4.2 and 4.3 are ordered in decreasing influence. The first two variables identified for each rank in Table 4.2 are highly influential compared with the remainder of the list. The first variable listed—having a detractor (see Table 4.4 for variable details)—in consideration for promotion to major and having a DP recommendation for promotion to lieutenant colonel and colonel, is at least as influential as all the remaining variables combined, and the second variables on each list—the respective remaining DP and detractor indicators—are at least twice as influential as the third on the lists. In Table 4.3, the top indicators for a DP recommendation listed are not as dominant as those

listed for selection in Table 4.2, but there is still a spread in the relative influence in each column. For receiving a DP recommendation to major, having a detractor is twice as influential as the second variable listed and four times as influential as the sixth variable listed. Attending intermediate developmental education in residence or having a detractor are approximately five times and three times more influential respectively than any other variable in receiving a DP recommendation for promotion to lieutenant colonel. For receiving a DP recommendation for promotion to colonel, attending senior developmental education in residence is approximately 50 percent more influential than having a detractor and seven times as influential as being a pilot (third and seventh on the list, respectively).

**Table 4.2. Top Ten Predictors of Selection, by Grade (USAFA Graduates, IPZ), Among Line Officers**

Major	Lt. Colonel	Colonel
Detractor (–)	DP (current) (+)	DP (current) (+)
DP (current) (+)	Detractor (–)	Detractor (–)
No SOS (–)	ISS in–residence (+)	Never commander (–)
SOS by correspondence (–)	Advance degree (+)	SSS in-residence (+)
ROTC senior rater (–)	Military order of merit (+)	ISS in-residence (+)
Academic order of merit (+)	Ever exec (wing+) (+)	Joint staff (+)
Military order of merit (+)	Deployed (–)	Other pilot w/command (+)
Fighter pilot (+)	Unit-level flyer <sup>17</sup> (–)	Serve at headquarters (+)
Record looks above the zone (–)	Corps of Civil Engineer (+)	Military Order of Merit (+)
Career broad assign (–)	Never commander (–)	BPZ to lieutenant colonel (+)

NOTE: SOS = Squadron Officer School.

**Table 4.3. Top Ten Predictors of DP Award, by Rank (USAFA Graduates, IPZ), Among Line Officers**

Major	Lt. Colonel	Colonel
Detractor (–)	ISS in-residence (+)	SSS in-residence (+)
Military order of merit (+)	Detractor (–)	BPZ to lieutenant colonel (+)
SOS by correspondence (–)	Fighter pilot (+)	Detractor (–)
SOS Distinguished Graduate (+)	Ever exec (wing+) (+)	Never a commander (–)
Good medals (+)	Military order of merit (+)	ISS in-residence (+)
No SOS (–)	SOS Distinguished Graduate (+)	Engineer (+)
Ever exec (wing+) (+)	Mission Support Squadron	
SOS Top Third (+)	Commander (+)	Fighter pilot (+)
Academic Order of Merit (+)	Advanced degree (+)	Joint staff (–)
Fighter pilot (+)	Good medals (+)	Good medals (+)
	Never a commander (–)	BPZ to Major (+)

<sup>17</sup> Unit-level flyer refers to refers to officers doing flight duties at the squadron level.

**Table 4.4. Variable Definitions for Tables 4.2 and 4.3**

<b>Variable</b>	<b>Definition</b>
Academic order of merit	An individual's relative academic performance at USAFA based on grades and semester hours. USAFA's formula may change over time. This metric was converted to a percentile by dividing it by class size.
Advanced degree	Advanced academic degree (master's or PhD). Could have been obtained by any method (full-time, off-duty, on-line, etc.).
BPZ to lieutenant colonel	Promoted below-the-zone (up to two years early) to lieutenant colonel.
BPZ to colonel	Promoted below-the-zone (up to two years early) to colonel.
BPZ to major	Promoted below-the-zone (early) to major. BPZ to major ended in 1998.
Career broadening assignment	Duty in a job unrelated to an individual's aeronautical rating or core ID (e.g., a pilot serving in an Acquisition job)
Core ID	A code that identifies which functional community "owns" an Air Force officer for assignment and development purposes.
Core of Civil Engineer	Air Force Specialty Code Core ID=32
Deployed	Temporary duty at a location other than where an individual is assigned.
Detractor	An attribute that reduces an individual's probability of promotion. For example, an established date of separation, an unfavorable information file, a bad performance report, failure to complete an advanced degree, failure to complete developmental education)
DP	A "definitely promote" promotion recommendation form prepared by an individual's senior rater prior to a promotion board. The percentage of DPs is controlled. Receiving a DP almost guarantees promotion IPZ.
Engineer	An individual who is managed by the Core 62 career field. Includes Aero, Astro, EE, and mechanical.
Ever Exec	Ever assigned as an executive officer (administrative assistant to a commander or other high-ranking officer or senior civilian).
Fighter Pilot	A pilot whose major weapons system is a fighter aircraft (e.g., F-16, F-15, A-10, F-22)
Good Medals	Meritorious Service Medal (MSM) or higher for those meeting an O-4 board and higher than an MSM for those meeting O5 and O6 boards.
ISS in-residence	Attended Air Command and Staff College or other equivalent professional military education in-residence. Duration: approximately one year. Now called Intermediate Developmental Education (IDE).
Joint Staff	Ever served on the Joint Chiefs of Staff, which is composed of representatives from all the services who work for the Chairman of the JSC.
Military order of merit	An individual's relative military performance at USAFA drawn from peer ratings and ratings of superiors. USAFA's formula may change over time. This metric was converted to a percentile by dividing it by class size.
Mission Support Squadron Commander	An individual from Core ID = 21, 31, 32, 33, 35, 38, 61, 62, 63, 64, 65, or 71 who served as a commander while a field grade officer.
Never a commander	Never a commander as a field grade officer (major and above).
No SOS	Did not attend SOS in-residence and did not complete SOS by correspondence.
Other pilot with command	Any pilot other than a fighter pilot who served as a commander while a field grade officer.
Record looks above the zone	A recalled officer competing IPZ who, based on date-of-rank, appears to be ABZ.
ROTC senior rater	A senior rater who is in ROTC.

Variable	Definition
Scientist	An individual who is managed by the 61 career field. Includes Operations Research, Math, Psychology, Physics, Nuclear Engineer, Chemistry, and Biology.
Serve at Headquarters Air Force	An individual who was ever assigned to Headquarters Air Force (HAF). Most HAF jobs are at the Pentagon or in the Washington, D.C., area.
SOS by correspondence only	An individual who completed Squadron Officers School by correspondence, but did not attend in-residence.
SOS DG	Attended SOS in-residence and was a distinguished graduate. About 10 percent of those who attend SOS in-residence are DGs. The SOS DG program was suspended for a period of time, but is now active.
SOS top third	Attended SOS in-residence and was a top third graduate. The SOS Top Third program only existed for a few years but is no longer active. There should not be anyone who was both an SOS DG and SOS Top Third graduate.
SSS In-residence	Attended Air War College or other equivalent professional military education in-residence. Duration: approximately one year. Now called Senior Developmental Education (SDE).
Unit-level flyer	An officer assigned to flying duties who was not in a commander or operations officer billet.

NOTE: DG = distinguished graduate.

The fact that many of these characteristics are associated with increased likelihood of promotion is common lore in the Air Force—most Air Force officers could probably name these characteristics on demand, and few would dispute them. The more interesting point is the way these characteristics build over time, essentially separating those identified for quick promotion from those with less of a promotion future very early on. Initially, those with high order of merit tend to attend Squadron Officer School (SOS) in residence, and, among these, the best receive the “Distinguished Graduate” distinction or they make it into the top third. This leads to a DP award when considered for promotion to major, which leads to realized promotion. After promotion to major, these same factors *in addition to promotion to major BPZ* predict DP award when considered for promotion to lieutenant colonel, which then leads to promotion. This process continues with promotion to colonel (and potentially beyond). This story does not imply that these specific characteristics *cause* promotion. Some are visible to promotion boards; others are not visible to boards but are correlated with officer quality traits that affect performance and career paths. The point is that gaining an advantage in promotion to colonel begins quite early in an officer’s career, because of better performance, better assignments (i.e., opportunities to demonstrate performance), or some combination thereof.

### *Use of Policy Tools Could Mitigate Gaps*

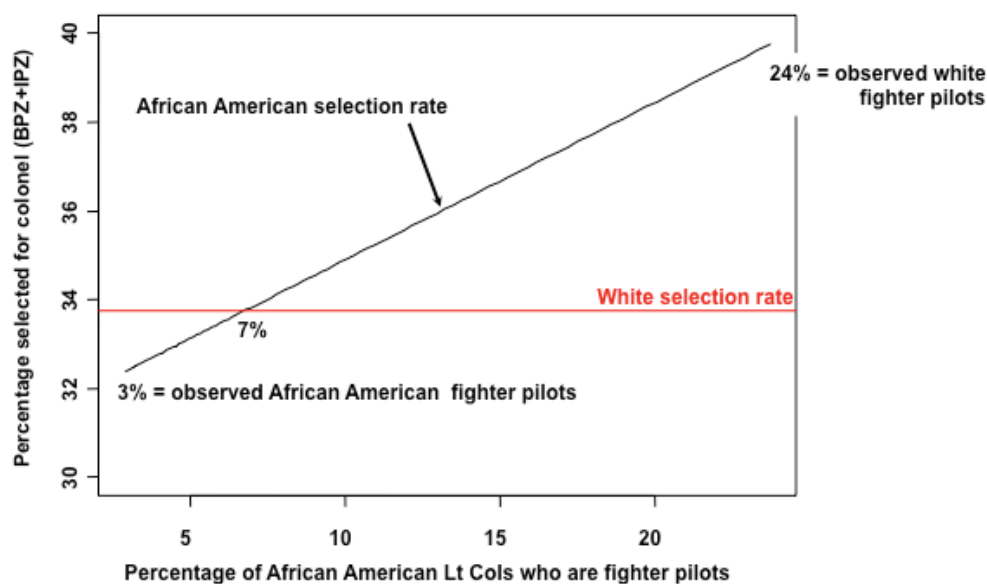
While there were few unexplained racial/ethnic gaps, this reality does not change the facts that minorities will continue to have lower promotion rates to the degree that they lack the characteristics in Tables 4.2 and 4.3. For example, in all the USAFA graduates who met colonel promotion boards from 1999 to 2007, 3 percent of the African American officers were fighter pilots, compared with 24 percent of the white officers. Thus, due to this difference alone, one

would expect lower selection rates for African Americans. If promotion policies remain fairly constant, policymakers would need to increase the number of African American fighter pilots in order to mitigate this promotion gap.

To illustrate this concept, we use the promotion model to predict selection rates for African American cohorts with different fractions of fighter pilots. We vary the percentage of African Americans that are fighter pilots by adding additional weight to those in the actual data who are fighter pilots. Thus, the simulation shows the hypothetical promotion rates if there were more African American lieutenant colonels from the USAFA with the same characteristics as those African Americans who are fighter pilots. Figure 4.2 shows the results of this simulation.

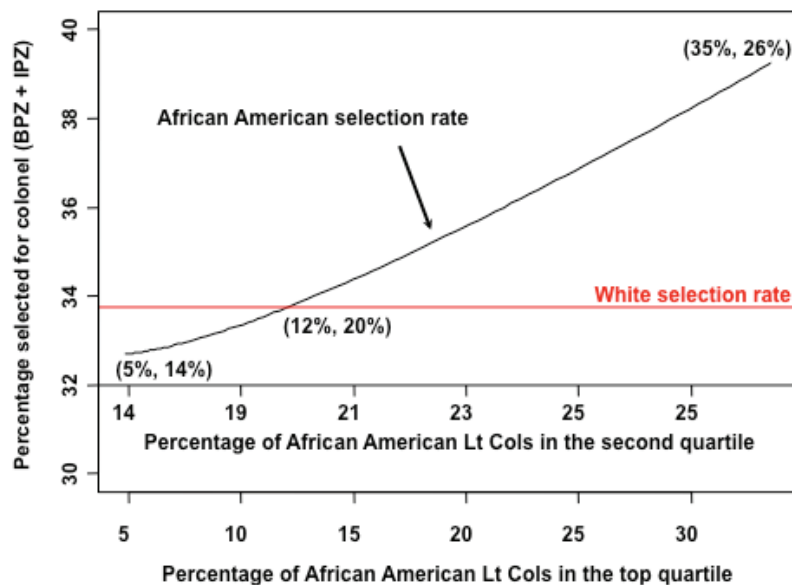
The black line shows how the African American selection rate changes as we increase the percentage of African American lieutenant colonels who are fighter pilots (by adding additional weight to the African American fighter pilots in our data). The horizontal, red line is the white selection rate, just below 34 percent. The “break-even” point occurs at 7 percent: that is, if 7 percent of African American lieutenant colonels were fighter pilots instead of 3 percent, we would see similar promotion rates between the two groups. If the African American lieutenant colonel USAFA graduates had the same concentration of fighter pilots as the white lieutenant colonels (24 percent), the African American promotion rate would be substantially higher than the white promotion rate. Thus, small increases in the number of African Americans who become fighter pilots could produce notable gains for diversity, given the current structure of the promotion system. Such gains may involve direct or indirect costs (e.g., incentives for pilots), which the Air Force will have to determine.

**Figure 4.2. Average BPZ and IPZ Selection Rates Versus Simulated Fraction of Fighter Pilots from USAFA, 1999–2007**



Another potential policy lever for increasing the promotion prospects for minority officers is USAFA order of merit. By this we do not mean that there is some sort of causal mechanism between class rank and promotion; rather, we observe that individuals who are more competitive at the USAFA tend to also do better later. This may be because they have characteristics that lay a foundation for strong performance later, because they were denied a “definitely promote” and are able to compete strongly for promotions, or because of some other reason. Whatever the mechanism, recruiting minorities that rank higher in USAFA order of merit could be a policy tool for mitigating promotion gaps later. We use the same simulation technique to illustrate this point, but this time we increase the fraction of minorities that graduate in the first and second quartile in overall order of merit. Figure 4.3 shows the results of this simulation.

**Figure 4.3. Average BPZ and IPZ Selection Rates Versus Simulated Fraction in First Quartile and Second Quartile of USAFA Order of Merit Distribution, 1999–2007**



Again, the black line shows how the African American selection rate varies as we increase the fraction of African American lieutenant colonels in the first and second quartiles of the order of merit distribution. In our data, 5 percent of African American lieutenant colonels graduated in the top quartile, and 14 percent of African American lieutenant colonels graduated in the second quartile (compared with 35 and 26 percent of white lieutenant colonels, respectively). This time, the “break-even” point for promotion rates is 12 percent in the top quartile and 20 percent in the second quartile. Again, if the concentration for the African Americans matched that for white officers, the African American selection rate would be substantially higher. Thus, relatively modest increases in the competitiveness of African American cadets could lead to significant gains in promotion rates and, eventually, senior-level diversity. This simulation also shows that,



conditioning on order of merit scores, promotion boards for colonel showed a slight selection preference for African Americans. However, this is not enough to make up for significant differences in order of merit scores between African American and white promotion candidates.

## Conclusion

This analysis yields two major conclusions for Air Force policymakers. First, there is no evidence to suggest that the Air Force promotion system is unfair, in that there are few large and unexplained racial/ethnic or gender differences in the probability of promotion after accounting for all metrics for which quantitative data were available. Rather, racial/ethnic and gender groups have the same promotion outcomes 93 percent of the time when the appropriate available comparisons are considered; the other 9 percent of the time, observed differences may either be the result of metrics for which we have not been able to account, such as stratification noted within promotion recommendations, or the result of real differences across groups. Second, many of the predictors of promotion to the more senior levels actually begin with characteristics that are determined early in an officer's career, including career field. Furthermore, promotion prospects are not reset at each level, but rather these important characteristics accumulate over time.

The implication of these findings for minority groups in the Air Force is that when these groups, on average, lack these vital characteristics, their promotion prospects will be greatly diminished. For example, Figure 4.1 showed that African Americans tend to have lower USAFA order of merit ranks. The data show that this lower order of merit ranking is strongly correlated with (though not necessarily causally related to) promotion, and that this lower ranking could translate into lower promotion rates for African Americans. In addition, Tables 4.2 and 4.3 showed that some career fields have higher promotion likelihoods than others. Because minorities tend to locate in different (and less-promoted) career fields than whites, they have lower promotion rates.

Finally, these results suggest that if improving promotion prospects for minorities is a policy goal, the Air Force likely needs to begin with recruiting. The accession sources should seek comparable quality across ethnic/minority groups in their admission and selection processes, since competitiveness even at this stage is a predictor of promotion success. More research may be needed to ascertain how to recruit highly qualified minority candidates into the Air Force officer corps. One possibility involves changing the mix of schools with Air Force ROTC detachments, possibly to more-selective colleges. Another involves changing the mix of high school students that the USAFA attempts to recruit. In addition, career field selection may also be a useful tool in improving minority promotion opportunities, especially for pilots and other fields with higher promotion rates.



## 5. Conclusions and Recommendations

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The analyses presented here examine the dynamics of officer progression in the Air Force through the lens of race/ethnicity and gender in order to identify barriers to diversity in its senior leadership. We have analyzed eligibility, accessions, retention, and promotions by race/ethnicity and gender. Below, we summarize the findings and identify resulting recommendations for Air Force policy.

### Recruiting

Unlike a civilian organization, the Air Force's senior leadership enters the organization almost exclusively at the lowest officer grade. In addition, individuals must meet specific requirements to become an Air Force officer, including citizenship, education, and health. We found that the majority of American youth cannot meet these three fundamental requirements and that the rates of meeting these requirements vary by race/ethnicity and gender. Moreover, the Air Force does not control the factors contributing to low rates of eligibility among racial/ethnic minority youth (i.e., education, citizenship, and health). The general U.S. population is therefore not an appropriate benchmark for evaluating the diversity of incoming Air Force officers. We constructed a benchmark that is more applicable by taking into account the major Air Force accession requirements, and we found that the Air Force has recruited accessions that closely mirror the racial/ethnic makeup of the eligible population. We conclude that most of the reason Air Force accessions are less diverse than the general population in terms of race/ethnicity is because some minority groups meet Air Force requirements at lower rates.

In contrast, women are more likely than men to meet the officer requirements because a higher proportion of women graduate from college. Therefore, the reason Air Force accessions are less diverse than the general population in terms of gender is not because of Air Force requirements. Using the eligible population as the benchmark actually shows a greater gender gap between the benchmark population and incoming officers.

We recommend that the Air Force use a benchmark like the one constructed in Chapter Two to assess the diversity of its incoming officers, because it is a much more accurate reflection of the population from which officers are drawn. More attention may need to be drawn to gender diversity, given recent trends that indicate the number of women in the overall Air Force has declined in the past few years compared with other services (Bumiller and Shanker, 2013).

When we added a rough estimation of preference for military service to the benchmark, the gap between the benchmark U.S. population and the incoming officers widens for race/ethnicity and narrows for gender. Racial/ethnic minorities have higher preference for military service than whites, while women have lower preference than men.

Together, these results point to important policy implications. The Air Force has little influence over background social patterns and institutions that contribute to lower education, citizenship, and health eligibility among minorities. This means that either selection criteria need to change or the Air Force will need to focus on outreach and recruiting strategies if it wants to draw in more minority youth. The Air Force can and should engage in ongoing evaluation of its selection criteria to maximize its ability to identify excellent future officers and to minimize unnecessary exclusion of minority candidates. At the same time, given the basic officer requirements in these areas today, outreach and recruiting strategies are needed for minority youth. They are also needed to increase the number of young women, not because of lack of qualifications but because of lack of interest.

The Air Force will need to convince qualified minority youth and young women to see the Air Force as an employer of choice if it wants accession cohorts to look like the country. For African American and Hispanic youth, whose preference for military service is already higher than that of whites, the task is to identify and reach those youth who are interested and qualified but for some reason are choosing another employer. For young women, whose preference for military service is lower than young men's, the task is to persuade more women to become interested in the Air Force.

In both cases, the Air Force needs to employ systematic and enduring efforts that focus its strategies for each group. These underrepresentations are long-standing, and a shift will not be accomplished without clear and persistent efforts that take into account such things as what effective outreach looks like, recruiter selection and management, advertising, incentives, and obligations. Another approach might include goals for the number of applicants from underrepresented groups to clarify the amount that recruiters need to change their targets and enable ongoing assessment of progress. Whether or not they include goals, however, these efforts should have data-driven evaluation plans built into them to assess effectiveness and cost.

## Accession

We documented that, over time, the Air Force has increased the percentages of each incoming officer cohort that are members of racial/ethnic minorities and women. The increase in minority accessions overall reflects an increase in Hispanic and Asian American accessions.

Noting this increase in accessions, we then examined whether we saw a parallel increase in the representation of minorities and women at higher grades. We found that racial/ethnic minorities are represented across pay grades in similar proportions as their accession year groups. Thus, the Air Force appears to retain officers of all racial/ethnic groups similarly; the level of racial/ethnic diversity seen in an incoming cohort of officers is likely to be carried through to senior levels, if all other policy remains the same. Women, however, are significantly underrepresented in higher pay grades, relative to their accession year groups. For gender

diversity, then, even if an accession cohort has a large group of women, there will be substantially fewer women at senior levels.

Officers progress up through pay grades via retention and promotion, and rates of retention and promotion vary by career field, which is chosen at accession. We examined these, as described below, to identify contributing factors that might be amenable to policy changes.

## Retention

We investigated lower retention among women and found that in the early years of being an officer, much of the lower retention rate among women can be explained by gender differences in marital status, race/ethnicity, number of dependent children, rank, occupation, and source of commission. However, these characteristics do not appear to explain lower retention among women among the more experienced officers, particularly between five and 11 years of service. This unexplained portion may be the result of career or family characteristics having a different effect on retention among women and men, or it may be the result of different characteristics that we could not observe.

We therefore wondered whether there were something unique about the Air Force that might lead to lower retention among women, and we examined the retention rates between civilian men and women as a comparison. In contrast to Air Force officers, we found that observable career and family characteristics explain none of the difference between men's and women's rates of leaving a civilian employer in either early or late years. This suggests that women and men in both the Air Force and the civilian workforce experience something that leads to different male and female retention rates. In the Air Force, however, we found more evidence that observable family and career characteristics explain at least some of these differences, particularly in the early career period, although this may be an artifact of more precise family and career information being available for Air Force officers compared to their civilian counterparts. Further research is needed to identify what specific factors contribute to women's lower retention. Some of this research is ongoing, and further investigation of the relationship between retention and family circumstances, career characteristics, geographic mobility requirements, and male-dominated settings needs to be explored as well.

## Promotion

The other component of the diversity of senior leaders is promotion. We examined three promotion outcomes by race/ethnicity and gender: a recommendation of "definitely promote," whether or not an officer was actually selected for promotion, and whether or not an officer without a "definitely promote" recommendation was actually selected for promotion. In the vast majority of cases, there were no differences in the promotion outcomes of whites, African Americans, and Hispanics, and of men and women. Those that did show differences usually favored whites over African Americans and Hispanics, while two cases with differences were

split across gender. The designation of “definitely promote” in the racial/ethnic comparisons was the most common outcome in which differences showed up and should be investigated further to determine whether there is a reason behind these few cases or whether they are random. In general, however, the analysis provides no evidence that the promotion system is unfair, in that the probability of promotion is the same in almost all cases.

In addition, the findings reveal how several characteristics that are strong predictors of promotion to senior levels actually start with characteristics that developed early in an officer’s career. The importance of these characteristics grows over time, because promotion prospects at each level take into account an officer’s entire career; they are not reset at each pay grade.

For minority groups who are less likely to have at least some of these vital characteristics, promotion prospects diminish as their careers move forward. The policy implications of the analysis of promotion, then, circle back to recruiting and accessions, where many of these characteristics begin. Recruiters, college selection officials for ROTC and the USAFA, and those responsible for final selection for commissioning need to identify applicants of all racial/ethnic groups who are of high and *comparable* quality. This means that high school students selected for ROTC and the USAFA need to be comparably strong, that ROTC programs should draw from highly selective colleges and universities, and that minority cadets at the USAFA should have the same level of qualifications, on average, as white cadets. As shown in the results, even a small change in the rankings of minority USAFA undergraduates can lead to notable changes in diversity later.

Second, more racial/ethnic minorities and women who are cadets and officers need to be in rated career fields, which have the highest promotion rates (e.g., pilot, navigator, air battle manager, combat systems officer, flight surgeon). Currently, minorities and women are less likely than whites and men to be in rated fields and more likely to be in fields that have lower promotion rates. This is one of the factors determined at the start of officers’ careers that accumulates in importance over time for senior-level diversity (Lim et al., 2009). The reasons that whites and men are more likely to be in rated fields than either minorities or women are not fully clear and need to be better understood. However, the Air Force need not wait to understand all of this to encourage more strong minorities and women to enter rated fields where promotion is highest.

Finally, the findings presented here suggest two research-related recommendations. First, we recommend that the Air Force adopt the propensity score methodology employed in Chapters Three and Four to identify barriers to diversity. The methodology is robust and produces reliable results. Second, the findings here point to several areas where further research would illuminate more of the causes of low levels of diversity at senior levels and more effective ways to respond to address those causes. These include ways to recruit competitive racial/ethnic minorities, career field selection, the effect of force-shaping policies on racial/ethnic and gender diversity, ways to retain women, gender differences in retention in related career fields, and the effect of combat on women’s retention.

## Appendix A. Doubly Robust Estimation

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This appendix provides additional details for the analyses conducted in Chapters Three and Four that use doubly robust estimation to estimate counterfactual outcomes.

Doubly robust (DR) estimation techniques use a combination of weighting and regression to control for confounding variables in the estimation of comparative outcomes between a group of particular interest and a comparison group in an observational setting. The group of interest may be the recipients of an intervention or possess a unique feature. The comparison group is often referred to as the “control” group. The expected difference in outcomes between these two groups, after accounting for the relevant confounding variables, is an estimate of the impact of membership in the group of interest.<sup>18</sup> The following paragraphs describe the techniques used to perform the DR gender comparisons of retention in Chapter Three and the racial/ethnic and gender comparisons of officer promotion outcomes in Chapter Four. As an example, we describe the DR process for estimating the impact of being a woman on the chance of being selected for promotion; the implementation described is identical for all other outcomes and all other groups of interest considered.

The first step in each DR comparison is to compute a *propensity score* for men in the officer corps. A man’s propensity score is the probability that someone with his set of observable characteristics (other than gender) is a woman; i.e.,  $P(Z_i=1 \mid x_i)$ , where  $x_i$  is a vector of observed characteristics and  $Z_i=1$  when person  $i$  is a woman and  $Z_i=0$  otherwise. In this type of analysis, propensity scores capture how similar an individual man is to the typical woman in the officer corps. If we did not know which officers were which, a propensity score would be an appraisal of how likely each officer is to be a woman given his or her characteristics (excluding gender). Those men who are most similar to the women would end up with the highest propensity scores. Put another way, the propensity score is an estimate of the probability that a randomly selected person with a particular set of attributes is in the group of interest, rather than in the control group.

Rosenbaum and Rubin (1983) show that adjusting for the propensity scores removes the confounding influence of the observable characteristics. In other words, statistical analysis can compare observations with similar propensity scores in the group of interest and in the control group without fear of bias from the observable characteristics. This important result leaves the analyst with two major decisions: how to compute the propensity scores and how to adjust for them.

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<sup>18</sup> When the impact of interventions is considered, the group of interest is commonly referred to as the “treatment” group and the estimated difference between treatment and control is known as the “treatment effect.” As membership in the group of interest is defined by possessing an observed characteristic in our analyses, we do not adopt that language here.

This analysis uses the generalized boosted model (GBM; Ridgeway, et al., 1999) technique to estimate the propensity scores, as described by McCaffrey, Ridgeway, and Morral (2004). As discussed in Chapter four, the GBM is an automated probability predicting algorithm that experiments with flexible nonlinear functional forms (regression trees) to find the optimal model fit—as measured by the Bernoulli log-likelihood function. In addition, this analysis chooses the number of terms in the GBM model to maximize the balance between the weighted control group and the group of interest. More specifically, we choose the propensity scores that maximize the similarity between the distributions of observable characteristics in the two groups (Ridgeway and McCaffrey, 2007).

Once the GBM computes the propensity scores, they are used to weight observations in the control group (men in the officer corps in this example) in order to remove differences in observable characteristics between the two groups. To do so, observations in the control group receive a weight equal to:

$$w_i = P(Z_i=1 | x_i)/(1 - P(Z_i=1 | x_i))$$

(McCaffrey, Ridgeway, and Morral, 2004), which is the odds of being a woman given their observable nongender characteristics  $x_i$ , while observations in the group of interest receive a weight of  $w_i = 1.0$ . The distribution of  $x_i$  for the weighted men will then match as closely as possible the distribution of  $x_i$  for the women. A traditional propensity weighted comparison of means (i.e., comparing the observed mean for the group of interest to the weighted control group mean) would estimate the effect of being a woman on selection for promotion, controlling for observable characteristics.

While the weighted comparison does attempt to control for the confounding variables, small differences in the distributions of the confounding variables will remain between the group of interest and weighted control groups (see, for example, Table 3.1 and Figure 4.1). This report takes an additional step and performs a DR analysis by using the weights described above to fit a weighted logistic regression model for the outcome. DR methods are superior to either the weighted comparison or the pure parametric regression because they remain consistent if either the propensity score model or the regression model is correctly specified (Bang and Robins, 2005). DR methods offer an advantage over a weighed comparison alone, because the weights may not fully remove all confounding differences between the two groups. When small differences remain after weighting, the regression controls should “catch” any remaining confounding influence. DR methods are better than a regression model alone because the regression model must rely on the arbitrary functional form to extrapolate in realms of the data with little similarity between the groups. Thus, a weighted regression where the two groups are already similar will naturally be far less sensitive to the functional form.

For each of the outcomes in Chapters Three and Four for which the DR models are employed, the weighted logistic regression has the following form:

$$\text{logit}(p(Y_i=1)) = \mu + \beta Z_i + \Psi X_i + \varepsilon_i$$

where  $Y_i=1$  if the outcome is positive (selection for promotion) and  $Y_i=0$  otherwise,  $\Psi$  is a vector of regression coefficients for the observed covariates, and  $\varepsilon_i$  is the standard regression error term. In fitting the model, each observation is considered according to the weight  $w_i$ . If  $\beta$ , the regression coefficient for the variable indicating membership in the group of interest, significantly differs from zero, then there is evidence that, after controlling for all the observed characteristics, being in the group of interest impacts the outcome. In the example, this would imply that men and women with identical records on the observed characteristics have a significant difference in the probability of selection for promotion.

Since we are using a logistic regression model, the coefficient  $\beta$  does not directly inform the magnitude of any significant differences. As described in Chapters Three and Four, we may use the fitted linear regression model to estimate such a difference by recoding all cases in the group of interest as control (i.e., change,  $Z_i=1$  to  $Z_i=0$ ), predicting their counterfactual outcomes using the model estimates for  $\beta$  and  $\Psi$ , and then comparing the observed proportion of successes in the group of interest to the estimated average probability of success in the comparison group.

Finally, it is important to stress that the DR method that this report employs is not a solution to omitted variables bias. Any unobservable differences that correlate with race/ethnicity or gender and the outcome of interest may bias the DR analysis. Thus, DR analysis accounts only for variables in the model and can still be confounded by variables that are omitted, particularly those unrelated to those included in the analysis (as an example, see the discussion of the results displayed in Table 4.1).



## Appendix B. Descriptive Statistics

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In this report, we describe the results of multiple DR regression analyses, including 20 separate examinations of continuation by gender in Chapter Three and 120 separate examinations of promotion outcomes by race/ethnicity and gender in Chapter Four. In each of the 140 DR implementations, we use the propensity scoring techniques described in the chapters and further detailed in Appendix A to account for distributional differences in observed covariates between the group of interest and the control group. While it would be impractical to detail the distributional differences across all model variables for each of the 140 cases, in the tables below we provide the reader with examples that illustrate the pre-weighting distribution differences across the relevant groups and highlight the need for propensity weighting to construct more appropriate comparisons. Table B.1 describes the pre-weighting differences on critical covariates used in the retention analyses between women and men who were officers during the span of 2001–2010. Tables B.2 through B.4 illustrate pre-weighting differences between women and men and between racial/ethnic minority and non-Hispanic whites competing for IPZ promotion aggregated over promotion cycles between 1998 and 2007 included in the promotion analyses.



**Table B.1. Descriptive Statistics by Gender among Officers with Five Years of Service,  
2001–2010 (%)**

	Women	Men
<b>Source of Commission</b>		
USAFA	13.1	20.9
ROTC	38.4	41.0
OTS	17.6	24.5
Other	30.9	41.0
<b>Career Field (Air Force Specialty Code)</b>		
Pilots	6.6	26.6
Navigators	2.5	7.0
Space, Missile, and Command and Control	6.1	8.7
Intelligence Utilization	6.7	4.5
Weather Utilization	0.9	1.1
Cyberspace Operations	5.4	7.4
Logistics	6.6	6.6
Security	0.6	1.6
Civil Engineering	1.8	2.5
Communications and Information, Services, Public Affairs, Personnel	1.8	0.5
Force Support	9.7	2.7
Medical and Health Services	34.4	13.0
Judge Advocate	2.6	1.6
Chaplaincy	0.2	0.9
Scientists	2.1	1.7
Engineers	2.7	5.8
Acquisition and Financial Management	3.7	4.1
Contracting	2.2	1.4
Financial Management	2.0	1.5
Special Investigations	1.3	0.7
<b>Marital Status</b>		
Single	31.6	26.4
Married to service member	32.0	8.3
Married to civilian	26.6	62.3
Divorced	9.8	3.0

	Women	Men
<b>Number of Children</b>		
0	73.6	61.2
1	14.1	15.5
2	8.6	14.5
3	2.8	6.2
4	0.7	1.9
5	0.2	0.5
6 or more	0.0	0.2
<b>Race/Ethnicity</b>		
African American	12.2	5.7
Asian American/Pacific Islander	5.9	4.1
Hispanic	5.2	5.1
Native American	0.6	0.7
Other/Unknown	9.6	9.1
White	66.4	75.2

**Table B.2. Descriptive Statistics by Gender and Race/Ethnicity Among Captains Competing for Promotion to Major, 1999–2007 (%)**

	Captains				
	Whites	African Americans	Hispanics	Men	Women
<b>For All</b>					
AFIT master's degree	11.4	5.2	6.8	10.7	11.1
Advanced degree	49.2	54.5	43.1	48.1	58.9
OTS DG	2.5	1.5	1.5	2.4	1.9
PhD	0.7	0.2	0.1	0.6	0.6
SOS DG	7.1	1.6	2.9	6.8	4.5
sos_tt	6.3	2.0	6.0	6.0	4.2
sos_grad	80.0	88.3	84.8	80.6	83.9
SOS by correspondence	5.5	6.1	6.0	5.5	6.5
No SOS	1.0	2.1	0.3	1.1	0.9
afit_stustat_brd	3.2	1.8	2.3	3.0	3.1
de_stustat_brd	0.1	0.2	0.0	0.1	0.1
na_stustat_brd	0.0	0.0	0.0	0.0	0.0
none_stustat_brd	96.4	97.7	97.7	96.6	96.4
pme_stustat_brd	0.3	0.3	0.0	0.3	0.4
afit_stustat_prf	1.7	0.9	0.7	1.5	1.9
de_stustat_prf	0.0	0.0	0.0	0.0	0.0
na_stustat_prf	97.0	98.4	98.4	97.3	96.3
none_stustat_prf	1.3	0.7	0.9	1.2	1.8
pme_stustat_prf	0.0	0.0	0.0	0.0	0.0
Broadening	5.8	7.5	6.0	5.6	8.9
Civil engineer	2.5	3.2	1.8	2.6	2.8
Fighter pilot	10.9	2.4	4.7	10.8	1.8
Intel	5.7	4.4	7.6	5.3	10.0
Logistics	7.4	11.4	10.8	7.4	10.4
Navigator	8.5	4.9	9.7	8.8	3.2
Office of Special Investigations	0.7	1.0	0.5	0.6	1.3
Other pilot	24.0	9.6	17.9	24.5	10.8
Security forces	1.5	1.9	1.2	1.7	0.8
Space	10.7	10.7	11.9	10.8	10.3
Weather	1.7	0.3	1.0	1.6	1.5
Acquisition	3.1	6.6	3.5	3.1	5.0

Captains					
	Whites	African Americans	Hispanics	Men	Women
Communications	7.6	15.4	10.3	7.9	11.2
Contracting	1.7	3.8	2.0	1.7	3.2
Engineer	6.1	4.1	5.6	6.2	3.9
Finance	1.3	4.2	2.7	1.4	2.2
mpw_corecf	3.2	11.7	5.1	2.7	13.1
Public affairs	0.8	1.0	0.8	0.5	3.1
Scientist	2.0	1.7	1.8	1.9	3.3
svvc_corecf	0.6	1.5	1.0	0.5	2.1
untelim	2.5	1.8	2.5	2.5	1.2
uptelim	3.0	2.4	4.0	3.2	2.1
assignmentlimit	5.1	5.0	4.9	4.5	9.9
no_deploy	8.3	12.8	11.6	8.0	13.0
yes_deploy	18.6	17.8	28.8	18.4	19.4
na_deploy	73.2	69.4	59.6	73.6	67.6
everexec	24.2	30.4	24.7	23.0	39.4
prior	17.8	21.0	17.9	17.7	16.1
OSD experience	0.0	0.0	0.0	0.0	0.1
Air Force HQ experience	1.1	2.3	0.8	1.0	2.4
Joint Staff experience	0.0	0.0	0.0	0.0	0.0
Fighter commander	0.0	0.0	0.0	0.0	0.0
Mission support commander	0.0	0.0	0.0	0.0	0.0
Non-rated other commander	0.0	0.0	0.0	0.0	0.0
Navigator commander	0.0	0.0	0.0	0.0	0.0
Never commander	100.0	100.0	100.0	100.0	100.0
Other commander	0.0	0.0	0.0	0.0	0.0
haffodder	0.4	0.2	0.1	0.3	0.7
ulf	37.0	15.1	28.6	37.4	13.0
Detractor	4.1	4.4	4.5	4.0	5.8
recalllooksipz	1.2	1.2	1.7	1.3	0.8
rotcsr	1.8	3.4	2.0	1.7	3.4
Ever Single Parent	3.9	8.3	5.3	3.7	8.8
Good Medals	25.3	26.4	23.9	24.2	32.2

Captains					
	Whites	African Americans	Hispanics	Men	Women
<b>For selection outcomes</b>					
Current DP	71.9	63.5	66.8	70.3	73.4
aad_dp_detractor	18.8	15.2	12.4	19.9	12.5
Record appears to indicate APZ to captain	0.5	0.5	0.6	0.5	0.2
<b>Gender</b>					
Women	9.6	22.6	10.9		
Men	90.4	77.4	89.1		
<b>For African American</b>					
HBCU graduate		21.8			
Non-HBCU graduate		56.3			
USAFA graduate		22.0			
<b>For Gender</b>					
Whites				82.9	73.7
African Americans				4.7	11.5
Hispanics				3.6	3.9
<b>For USAFA Commissioned</b>					
USAFA DG	2.5	0.3	0.9	2.4	1.0
<b>For ROTC Commissioned</b>					
ROTC DG	8.9	6.5	6.1	8.2	11.5

NOTE: AFIT = Air Force Institute of Technology.

**Table B.3. Descriptive Statistics by Gender and Race/Ethnicity Among Majors Competing for Promotion IPZ to Lieutenant Colonel, 1998–2006B (%)**

	Majors				
	Whites	African Americans	Hispanics	Men	Women
<b>For All</b>					
AFIT master's degree	16.2	8.4	13.1	15.4	17.9
Advanced degree	90.8	93.0	89.9	90.6	95.2
OTS DG	2.9	0.9	1.6	2.8	2.1
PhD	3.2	0.8	2.0	3.0	3.1
SOS DG	7.2	2.3	4.4	6.9	5.5
sos_tt	0.0	0.0	0.0	0.0	0.0
sos_grad	85.8	94.1	89.7	86.2	89.4
SOS by correspondence	6.9	3.6	5.8	6.8	5.1
No SOS	0.1	0.0	0.0	0.1	0.0
afit_stustat_brd	0.8	0.3	0.4	0.8	0.9
de_stustat_brd	1.6	1.3	2.0	1.5	2.0
na_stustat_brd	0.0	0.0	0.0	0.0	0.0
none_stustat_brd	93.9	95.5	94.0	94.2	93.4
pme_stustat_brd	3.6	2.8	3.6	3.5	3.8
afit_stustat_prf	0.6	0.1	0.6	0.5	0.7
de_stustat_prf	2.1	2.1	2.4	2.0	2.4
na_stustat_prf	89.7	92.2	90.7	90.2	89.3
none_stustat_prf	0.4	0.4	0.2	0.4	0.5
pme_stustat_prf	7.2	5.1	6.0	6.9	7.2
Broadening	9.8	10.3	11.7	9.7	12.8
Civil engineer	2.9	3.7	1.6	3.0	2.5
Fighter pilot	9.3	1.5	3.4	9.2	0.3
Intel	5.5	3.5	7.2	4.9	11.2
Logistics	7.3	13.3	8.0	7.3	12.2
Navigator	14.1	10.7	13.7	14.8	2.1
Office of Special Investigations	0.7	0.7	1.4	0.7	1.0
Other pilot	20.7	7.2	15.9	21.1	4.4
Security forces	1.3	2.2	1.2	1.4	0.7
Space	10.3	12.0	12.5	10.6	10.2
Weather	1.9	0.0	1.2	1.7	2.0
Acquisition	u	6.5	5.0	4.1	5.1

Majors					
	Whites	African Americans	Hispanics	Men	Women
Communications	6.3	15.2	10.3	6.2	16.5
Contracting	1.9	3.9	4.0	2.0	3.5
Engineer	6.9	2.7	5.6	6.7	5.8
Finance	1.3	5.1	2.2	1.3	4.0
mpw_corecf	2.7	8.4	4.2	2.3	11.3
Public affairs	0.6	1.3	0.4	0.5	2.5
Scientist	1.9	1.2	1.8	1.8	3.1
svvc_corecf	0.6	0.7	0.2	0.5	1.7
untelim	1.0	1.9	2.2	1.2	0.3
uptelim	3.9	3.5	5.6	4.1	1.5
assignmentlimit	6.7	6.1	8.7	6.7	6.4
no_deploy	11.1	12.0	13.7	10.9	12.4
yes_deploy	12.2	11.3	16.3	12.3	9.5
na_deploy	76.7	76.7	70.0	76.8	78.1
Ever an exec	26.1	33.6	30.6	25.1	43.3
prior	12.4	11.7	11.1	12.6	9.4
OSD experience	0.3	0.3	0.0	0.2	0.7
Air Force HQ experience	10.2	16.0	9.1	9.9	17.1
Joint Staff experience	1.0	0.9	0.8	0.9	1.4
Fighter commander	0.3	0.0	0.2	0.3	0.1
Mission support commander	11.0	21.9	13.3	10.9	20.4
Non-rated other commander	1.4	0.8	1.4	1.3	1.7
Navigator commander	0.6	0.9	0.2	0.7	0.1
Never commander	85.7	75.9	84.1	85.9	77.3
Other commander	1.0	0.5	0.8	1.0	0.4
haffodder	1.8	2.1	2.0	1.8	2.7
ulf	14.5	5.4	11.3	14.7	2.5
Detractor	10.1	12.6	9.3	10.4	9.0
recalllookspz	1.0	0.1	0.8	1.0	0.2
rotcsr	0.7	0.8	0.6	0.6	0.9
Ever Single Parent	5.2	10.0	7.4	5.0	11.5
goodmedals	4.0	1.9	2.2	3.9	1.3

Majors					
	Whites	African Americans	Hispanics	Men	Women
<b>For selection outcomes</b>					
Current DP	49.8	44.2	44.9	48.6	51.2
APZ to major	3.5	3.7	5.0	3.6	3.3
IPZ to major	94.8	95.4	93.0	94.9	93.6
BPZ to major	1.7	0.9	2.0	1.5	3.1
IDE in-residence	19.8	19.9	16.1	19.0	24.6
Record appears to indicate APZ to major	0.8	0.1	0.6	0.7	0.2
<b>Gender</b>					
Women	7.7	19.5	9.1		
Men	92.3	80.5	90.9		
<b>For African American</b>					
HBCU graduate		23.8			
Non-HBCU graduate		53.8			
USAFA graduate		22.5			
<b>For Gender</b>					
Whites				86.4	75.3
African Americans				4.6	11.7
Hispanics				2.8	3.0
<b>For USAFA Commissioned</b>					
USAFA DG	1.5	0.3	0.6	1.5	0.7
<b>For ROTC Commissioned</b>					
ROTC DG	11.5	11.1	10.3	10.9	17.3



**Table B.4. Descriptive Statistics by Gender and Race/Ethnicity Among Lieutenant Colonels Competing for Promotion IPZ to Colonel, 2000–2007 (%)**

Lieutenant Colonels					
	Whites	African Americans	Hispanics	Men	Women
<b>For All</b>					
AFIT master's degree	15.3	8.6	15.0	14.9	15.8
Advanced degree	98.6	98.6	100.0	98.5	99.5
OTS DG	5.0	0.5	3.6	4.6	4.8
PhD	3.8	0.7	2.1	3.6	3.6
SOS DG	11.6	3.3	8.3	10.9	9.7
sos_tt	0.0	0.0	0.0	0.0	0.0
SOS grad	74.7	86.0	81.3	75.4	77.5
SOS by correspondence	11.3	8.6	9.3	11.3	10.0
No SOS	2.4	2.1	1.0	2.5	2.9
afit_stustat_brd	0.5	0.0	0.5	0.5	0.3
de_stustat_brd	0.0	0.0	0.0	0.0	0.0
na_stustat_brd	0.0	0.0	0.0	0.0	0.0
none_stustat_brd	93.1	96.0	95.3	93.2	95.6
pme_stustat_brd	6.4	4.0	4.1	6.3	4.1
afit_stustat_prf	0.1	0.0	0.0	0.0	0.0
de_stustat_prf	0.1	0.0	0.0	0.0	0.0
na_stustat_prf	94.0	95.2	97.9	94.4	93.0
none_stustat_prf	0.4	0.2	0.0	0.4	0.2
pme_stustat_prf	5.5	4.5	2.1	5.1	6.8
Broadening	14.1	16.4	23.8	14.1	18.4
Civil Engineer	3.0	3.8	2.1	3.3	1.7
Fighter pilot	11.0	1.7	1.6	10.9	0.3
Intel	4.4	2.9	4.7	3.9	9.4
Logistics	9.5	17.8	15.5	9.8	15.7
Navigator	16.8	9.7	11.4	17.5	2.5
Office of Special Investigations	0.7	0.7	1.0	0.6	1.1
Other pilot	17.7	3.8	9.3	17.4	4.3
Security Forces	1.3	3.1	2.1	1.4	1.3
Space	8.2	10.0	16.1	8.8	7.0
Weather	1.4	0.0	0.0	1.3	1.3

Lieutenant Colonels					
	Whites	African Americans	Hispanics	Men	Women
Acquisition	5.4	7.8	6.7	5.8	4.9
Communications	6.5	15.0	11.9	6.4	15.8
Contracting	1.9	3.8	4.1	1.9	3.0
Engineer	4.2	1.2	3.1	4.0	4.1
Finance	1.4	6.2	3.6	1.6	4.1
mpw_corecf	3.9	9.7	3.6	3.2	15.5
Public Affairs	0.6	1.9	0.5	0.6	2.2
Scientist	1.1	0.0	2.6	1.0	2.2
svvc_corecf	1.0	1.0	0.0	0.8	3.5
untelim	2.1	2.1	1.0	2.2	0.2
uptelim	5.5	3.3	8.8	5.6	2.5
assignmentlimit	8.5	10.7	9.3	8.9	6.8
no_deploy	22.0	18.1	24.9	21.7	19.8
yes_deploy	14.5	7.8	11.4	14.1	8.4
na_deploy	63.5	74.1	63.7	64.2	71.8
Ever an exec	31.9	36.6	35.2	30.2	51.2
prior	11.5	15.9	16.1	12.1	8.7
OSD experience	1.9	2.9	3.1	1.7	4.4
Air Force HQ experience	19.5	25.7	23.8	19.3	28.4
Joint Staff experience	5.8	9.3	7.8	5.8	9.2
Fighter commander	7.6	1.0	1.0	7.5	0.3
Mission Support commander	26.9	53.7	40.4	26.9	52.0
Non-rated other commander	8.8	6.9	11.9	8.7	10.3
Navigator commander	8.4	3.8	5.2	8.5	1.7
Never a commander	37.8	32.5	35.8	38.2	33.1
Other commander	10.5	2.1	5.7	10.3	2.5
haffodder	1.8	2.1	1.0	1.8	1.9
ulf	6.1	1.7	2.6	6.2	0.3
Detractor	22.9	19.0	15.0	23.0	18.4
recalllookspz	0.3	0.2	0.0	0.3	0.2
rotcsr	1.6	1.7	1.6	1.5	1.7
Ever Single Parent	6.6	9.5	8.8	6.0	16.2

Lieutenant Colonels					
	Whites	African Americans	Hispanics	Men	Women
Good Medals	12.0	4.3	8.8	11.9	4.1
<b>For selection outcomes</b>					
Current DP	28.5	24.9	21.2	27.7	30.7
APZ to major	1.4	1.4	2.1	1.5	1.1
IPZ to major	89.5	93.8	88.6	90.3	84.8
BPZ to major	9.1	4.8	9.3	8.2	14.1
IDE in-residence	36.4	33.5	31.1	34.8	44.4
APZ to lieutenant colonel	2.1	2.4	1.6	2.2	0.6
IPZ to lieutenant colonel	89.1	91.0	91.2	89.5	88.9
BPZ to lieutenant colonel	8.9	6.7	7.3	8.3	10.5
SDE in-residence	17.6	18.5	17.1	16.7	26.0
<b>Gender</b>					
Women	8.2	18.5	13.0		
Men	91.8	81.5	87.0		
<b>For African American</b>					
HBCU graduate		25.9			
Non-HBCU graduate		59.6			
USAFA graduate		14.5			
<b>For Gender</b>					
Whites				87.1	75.4
African Americans				5.7	12.4
Hispanics				2.8	4.0
<b>For USAFA Commissioned</b>					
USAFA DG	2.1	0.0	0.5	2.0	1.0
<b>For ROTC Commissioned</b>					
ROTC DG	12.8	13.3	14.0	12.6	15.5

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Despite the Air Force's efforts to create a force that mirrors the racial, ethnic, and gender differences of the nation's population, minority groups and women are underrepresented in the active-duty line officer population, especially at senior levels (i.e., colonel and above). This report examines the reasons for this, with the goal of identifying potential policy responses.

The authors analyzed data from multiple sources on Air Force eligibility, youths' intention to serve, accessions, retention, and promotion. A key finding is that African Americans and Hispanics are underrepresented in the Air Force compared with the nation's population mainly because they meet Air Force officer eligibility requirements at lower rates (e.g., they are much less likely than whites to have a college degree). Another reason for lower representation of minorities and women among senior leaders is that, once in the military, women and minorities are less likely to choose career fields that give them the highest potential to become senior leaders. In addition, female officers have lower retention rates than male officers, and the reasons for this are not clear. Finally, the authors comprehensively examined the Air Force promotion system and found no evidence to suggest it treats women and minorities differently than white men with similar records. The authors recommend that the Air Force should seek comparable quality across ethnic/minority groups in the accession processes, since competitiveness even at this stage is a predictor of promotion success. More racial/ethnic minorities and women who are cadets and officers should be in rated career fields, which have the highest promotion rates to the senior ranks.



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